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Ocular surface changes before and after upper eye lid blepharoplasty

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Abstract
Background: Blepharoplasty has been the most effective treatment for upper eyelid dermatochalasis. Dry eye disease after blepharoplasty can only be detected after sufficient time to allow for resolution of the early and intermediate sicca symptoms.
Aim of work: studying the ocular surface changes before and after upper eyelid blepharoplasty.
Patients and methods: our prospective interventional cohort study conducted on 30 patients, (aged between 40 and 60 years) underwent upper eye lid blepharoplasty.
Results: The included 30 subjects were females only aged from 40 years to 60 years with the Mean±standard deviation were 51.07±4.93 years. The values of tear meniscus height, depth, and cross-section area decreased significantly at 1 month postoperatively, then started to increase after 3 months postoperative and returned like preoperative after 6 months.
Conclusion: Upper eye lid blepharoplasty can affect the ocular surface and tear film stability. The values of tear meniscus height, depth, and cross-section area and dry eye tests except the ocular surface staining decreased significantly at 1 month postoperatively, then started to increase after 3 months postoperative and returned like preoperative after 6 months.

Keywords: Blepharoplasty, dermatochalasis, dry eye disease

Introduction

Upper lid dermatochalasis is an involutional change that has cosmetic and functional impact. It could be associated with fat prolapse which typically occurs from the medial pocket. Surgical upper eyelid blepharoplasty is the standard option for upper eyelid dermatochalasis. It includes removing of excess skin and prolapsed fat [1, 2]. Dry eye disease after blepharoplasty can only be diagnosed after sufficient time to allow the symptom resolution of early and intermediate sicca [3]. Epiphora, ocular discomfort and blink dysfunction are common after blepharoplasty due to postoperative eyelid tissues swelling which interferes with the tear pump mechanism [4].

Patients and methods

The study was done at ophthalmology department; Tanta university hospitals. A written consent forms were obtained from all patients and the study wasn't started except after gaining the ethical committee approval of the faculty of medicine, Tanta university (approval code no.34053\ 8 |20).

It was prospective interventional cohort study conducted on 30 patients. The inclusion criteria: The patient's age ranged between 40-60 years with upper eye lid dermatochalasis. The exclusion criteria: Patient with Previous ocular or eye lid surgery. Any factors affecting tear film as medications, autoimmune disease. History of ocular trauma. Moderate to severe dry eye symptoms. Routine full ophthalmic examination including; visual acuity, cornea, conjunctiva, anterior chamber, pupil, iris, fundus and IOP. Examination of the eyelids, lid closure and lagophthalmos. Motility, strabismus, orbital, or eyelid asymmetry, exophthalmos. Measurement of the redundant skin of eyelid, prolapsed orbital fat, levator excursion, presence or absence of blepharoptosis for evaluation the type and degree of dermatochalasis. As well, detection of eyelid retraction, the amount of eyelid laxity, an changes in the bony framework and periocular tissues, eyelid position, and asymmetry, lid retraction, ptosis, lid fold height, inferior scleral show, entropion, ectropion and assessment of dry eye. Special attention to brow position and brow contour. Dry eye assessment by schirmer test, It was performed using schirmer paper (paper strips about 35 mm long, 5 mm wide)

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The strip was folded 5 mm from one end and hooked over the margin of lower lid at junction between middle third and outer third, without anaesthetic use and without touching the eye lashes or cornea. Patients were told to keep their eyes gently closed. After 5 minutes, we removed the filter paper and measured the amount of paper wetting. We considered wetting of less than 10 mm of the schirmer strip after 5 minutes abnormal value. Grade 0: ≥ 10 mm, Grade 1: 8 to 10 mm, Grade 2: 5 to 7 mm and Grade 3: < 5 mm.

Tear break up time test (TBUT) was evaluated by putting fluorescein impregnated paper strip in the lower conjunctival fornix after wetting with saline then the patient was told to blink frequently until homogenous fluorescein stained tear film was formed then the patient was told to keep their eyes open while look straight ahead. Observation with slit lamp using cobalt blue filter was done. The time between the last blink and the appearance of the first black spot in the tear film was measured. We considered more than 10 seconds for the first dry spot to appear after the last blink is normal value.

Measurement of slit lamp tear meniscus: To ensure consistency, patients blinked 2-3 times before the images were taken. Patients were told to look straight ahead at a fixation light with no background illumination and could blink spontaneously during the examination. The height of the tear meniscus formed between the lower lid margin and the bulbar conjunctiva was measured in mm, using cobalt blue filter of the slit lamp beam after adding fluorescein stain. Tear meniscus that less than 1mm height considered abnormal.

Staining of the ocular surface by fluorescein staining: We instilled a fluorescein impregnated paper strip (wetted by a drop of saline) in the lower conjunctival fornix. Using a cobalt blue filter in front of the ocular eyepieces with wide broad light beam of slit lamp.

Anterior segment OCT: FD-OCT system (RTVue, software version 2.7; Optovue Inc., Fremont, CA) was used. Room temperature was set at 21°C. Patients were instructed to look straight ahead at the fixed target in the OCT system. A 6-mm vertical line centered on the inferior corneal limbus served as the OCT pattern for the scan of the lower tear meniscus. Subjects were told to blink and then count to 3 seconds. Images were capured at 2 seconds after blinking. Tear-film OCT images were taken; the tear meniscus height (TMH), cross-sectional area (TMA) and tear meniscus depth (TMD) were all calculated.

After 6 months, Patient-Satisfaction score and Patient and Observer Scar Assessment Scale (POSAS) were used to assess the scar quality and satisfaction index of patients who treated by upper blepharoplasty and last postoperative photos were captured. Not satisfied take grade 0, moderately satisfied take grade 1, satisfied take grade 2 and very satisfied take grade 3.

Statistical analysis of the data: With the aid of the IBM SPSS software package version 20.0, data were input into the computer and analysed. Number and percentage were used to describe qualitative data. The normality of the distribution was examined using the Shapiro-Wilk test. The range (minimum and maximum), mean, standard deviation, median, and significance of the obtained results were used to describe quantitative data. Significance was determined at the 5% level.

Results: The included 30 subjects were females only aged from 44 years to 58 years with the Mean±SD was 51.07±4.93 years.

Schirmer test in different studied periods
We compared schirmer tests results between the different studied periods as in figure 1, we found that schirmer test before blepharoplasty ranged between 8- 26 with median 16. After one month of blepharoplasty, schirmer test reduced between 8- 18 with median 13, after 3 months it begun to increase to 10-23 with median 15 while after 6 months it returned as before blepharoplasty 9-25 with median 19. There is a significant correlation between schirmer tests in different studied periods as shown in table 1.

TBUT in different studied periods
Our study revealed that TBUT Was < 10 seconds in 26.7% of patients before blepharoplasty, they decreased to 20% in the first month after the operation then all cases had > 10 seconds after 3 months. TBUT became > 10 seconds in 86.7 of patients 6 months post-operative. There is a significant correlation between TBUT test and different studied periods as shown in table 2.

Surface staining in different studied periods
In this study, we noticed that 20% patients had surface staining preoperative, they still had stain in the first month post operation then the stain reduced to 6.7%of cases 3 months post-operative. After 6 months, only 13.3% had surface staining. There was improvement in the ocular surface staining after blepharoplasty. There is no significant correlation between ocular surface staining and different studied periods as shown in table 3.

OCT tear meniscus height (TMH), area (TMA) and depth (TMD) in different studied periods:
By using anterior segment OCT; we compared TMH in the different studied periods as in figure 2. It was 192.3 – 312.0 um preoperative and 1 month post-operative, it decreased to 158.0 – 273.8 um. It started to increase to 196.7 – 292.8 um after 3 months while after 6 months post-operative, it became 159.5 – 310.6um. There is a significant correlation between OCT TMH and different studied periods. We compared TMA in the different studied periods. It was 7645 – 34116 um^2 preoperative and 1 month post-operative, it decreased to 6432 – 26589 um^2. It started to increase to 7953 – 34266 after 3 months while after 6 months post-operative, it became 6121 – 36232 um^2. There is a significant correlation between OCT TMA and different studied periods. Also, we compared TMD in the different studied periods. It was 121.4 – 190.3 um preoperative and 1 month post-operative, it decreased to 113.6 – 168.7 um. It started to increase to 113.6 – 184.6 after 3 months while after 6 months post-operative, it became 94.70 – 195.5 um. There is a significant correlation between OCT TMD and different studied periods as shown in table 4.

Satisfaction score and patient and Observer Scar Assessment Scale (POSAS)
After 6 months, Patient-Satisfaction score and POSAS were done. We found that 70% of cases were very satisfied and 10% were not satisfied in satisfaction score while in POSAS, 73.3% the scar had no visible along the incision site and 10% of cases had hypertrophic scar.

Discussion
Upper lid dermatochalasis is an involutional change that has

cosmetic and functional impact. It may be associated with fat prolapse commonly from the medial pocket. Surgical upper eyelid blepharoplasty is the classic treatment option of upper eyelid dermatochalasis. It involves excision of excess skin and prolapsed fat [1, 2].

After one month of blepharoplasty, we noticed that schirmer test significantly reduced, after 3 months it begun to increase while after 6 months it returned as before blepharoplasty. While the study of Shao *et al*. 2014 [5] reported that 1 week after surgery, the Schirmer test values significantly dropped ($P<0.01$), but by 3 months, they were back to normal. As well, De Lima *et al*. 2006 [6] reported 29 patients with dermatochalasis were included in their prospective study, which was conducted before and three months after blepharoplasty. There was no statistically significant difference between the pre- and postoperative periods for any objective tests, with the exception of the Schirmer II test.

Our study revealed that TBUT decreased in the first month after the operation then all cases were normal after 3 months. After 6 months of operation, TBUT became > 10 seconds in 86.7 % of patients. There is a significant correlation between TBUT test and different studied periods In contrary, De Lima *et al*. 2006 [6], Aydemir *et al*. 2021[7] and Rymer *et al*.2017 [8] who hadn't found significant differences in the group of blepharoplasty between the preoperative and postoperative dry eye test and tear measurements ($P>0.005$/for all)

In this study, we noticed that 20% patients had surface staining preoperative, they still had stain in the first month post operation then the stain reduced to 6.7%of cases 3 months post-operative. After 6 months, only 13.3% had surface staining. There is no significant correlation in fluorescein staining of the ocular surface in our patients. Rymer *et al*.2017 [8] study has similar results as our study; they reported that fluorescein staining scores diminished 30 days after surgery, but there were no noticeable differences (in comparison to the preoperative scores) at 90 days.

OCT is non-invasive, effective and promising technology to evaluate the tear meniscus. Tear menisci examination may be useful in detection of dry eye, as they decrease in dry eye. TMH can be used to measure the tear volume [9]. Upper blepharoplasty could increase the tear film instability which plays an important role in development of postoperative dry eye in the early postoperative period and within 6 months after surgery [10].

In the present study, we evaluated the effects of upper lid blepharoplasty on tear film by using anterior segment-OCT to measure changes in tear meniscus after this procedure. The values of tear meniscus height, depth, and cross-section area decreased significantly at 1 month postoperatively, then started to increase after 3 months postoperative and returned like preoperative after 6 months. Eroglu *et al*., 2016 [11] found in their study that There was a significance between the values of TMH, TMD, TMA, TBUT and Schirmer test ($P<0.001$, for each set of parameters). These results were similar to our results. Our study agreed with Shao *et al*. 2014 [5] study who reported that the values of TMH, TMD, and TMA significantly increased at one week after surgery, but dropped after one month ($P<0.01$) and back to baseline after three months ($P>0.05$). As well, the study of Yan Y *et al*. 2019, [12] revealed that a significant increase in Schirmer test I, TBUT and TMH values at 1 week after surgery and back to baseline levels at one month and three months after operation.

Our results revealed that Patient-Satisfaction score were 70% of cases were very satisfied and 10% were not satisfied in satisfaction score while in POSAS, 73.3% the scar wasn't visible along the incision site and 10% of cases had hypertrophic scar 6 months post-operative. Akkaya *et al*, [13] used the postoperative satisfaction assessment forms that 83.59% of cases were very good, 11.72% were good and 4.68% of cases were Moderate. According to POSAS 67.97% of patients had almost no scar tissue on the line of incision, 28.13% had some scar tissue that could be seen on close inspection, and 3.91% had visible scar tissue.

Summary: We found that all the dry eye tests had statistical significance except the ocular surface staining. The values of TMH, TMD, TMA area decreased significantly one month after surgery, then started to increase after 3 months postoperative and returned like preoperative after 6 months.

Table 1: Comparison between the different studied periods according to Schirmer test (n = 30)

	Before	After			F	p
		1 Month	**3 Months**	**6 Months**		
Schirmer test						
Min. – Max.	8.0 – 26.0	8.0 – 18.0	10.0 – 23.0	9.0 – 25.0	12.620	<0.001*
Mean±SD.	15.20±5.46	12.67±3.38	15.33±4.85	16.93±5.76		
Median	16.0 (9.0 – 18.0)	13.0 (10.0 – 15.0)	15.0 (10.0 – 21.0)	19.0 (11.0 – 23.0)		
p_0		0.002*	1.000	0.562		
Sig. bet. Periods.		$p_1<0.001^*$,$p_2<0.001^*$,$p_3<0.001^*$				

SD: Standard deviation

F: F test (ANOVA) with repeated measures,

Sig. bet. periods was done using Post Hoc Test (adjusted Bonferroni)

p: p value for comparing between the studied periods

p_0: p value for comparing between before and each periods

p_1: p value for comparing between 1 Month and 3 Months

p_2: p value for comparing between 1 Month and 6 Months

Table 2: Comparison between the different studied periods according to TBUT (n = 30)

	Before		After						Q	p
			1 Month		**3 Months**		**6 Months**			
	No.	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**		
TBUT										
<10	8	26.7	6	20.0	0	0.0	4	13.3	12.353*	0.006*
>10	22	73.3	24	80.0	30	100.0	26	86.7		
p_0			0.401		0.001*		0.093			
Sig. bet. periods.			$p_1=0.012^*$,$p_2=0.401$,$p_3=0.093$							

Q: Cochran's test, Sig. bet. periods was done using Post Hoc Test (Dunn's)

p: p value for comparing between the studied periods

p_0: p value for comparing between Before and each periods

p_1: p value for comparing between 1 Month and 3 Months

p_2: p value for comparing between 1 Month and 6 Months

p_3: p value for comparing between 3 Month and 6 Months

*: Statistically significant at $p \leq 0.05$

Table 3: Comparison between the different studied periods according to surface staining (n = 30)

	Before		After						Q	p
			1 Month		3 Months		6 Months			
	No.	%	No.	%	No.	%	No.	%		
Surface staining										
No stain	24	80.0	24	80.0	28	93.3	26	86.7	3.474	0.324
Stained	6	20.0	6	20.0	2	6.7	4	13.3		

Q: Cochran's test

p: p value for comparing between the studied periods

Table 4: Comparison between the different studied periods according to OCT TMH, TMA, TMD. (n = 30)

	Before	After			F	p
		1 Month	3 Months	6 Months		
OCT TMH (um)						
Min. – Max.	192.3 – 312.0	158.0 – 273.8	196.7 – 292.8	159.5 – 310.6	9.921*	0.002*
Mean±SD.	255.5±39.02	222.9±33.42	239.9±28.33	250.0±45.40		
Median (IQR)	249.3 (217.4 – 297.2)	217.5 (199.0 – 263.)	229.4 (219.9 – 268.6)	257.4 (227.5 – 290.7)		
p_0		<0.001*	0.122	1.000		
Sig. bet. periods.		p_1=0.006*,p_2=0.013*,p_3=0.133				
OCT TMA (um²)						
Min. – Max.	7645.0 – 34116.0	6432.0 – 26589.0	7953.0 – 34266.0	6121.0 – 36232.0	31.120*	<0.001*
Mean±SD.	22444.1±10300.9	13272.5±6755.5	17512.7±7959.4	20923.1±10150.9		
Median (IQR)	27116.0 (9876 – 31832)	10008.0 (8752 – 20482)	15313.0 (10230 – 26618)	21680.0 (10895 – 32412)		
p_0		<0.001*	0.072	0.689		
Sig. bet. Periods.		p_1=0.005*,p_2<0.001*,p_3=0.028*				
OCT TMD (um)						
Min. – Max.	121.4 – 190.3	113.6 – 168.7	113.6 – 184.6	94.70 – 195.5	13.371*	<0.001*
Mean±SD.	160.1±23.18	134.2±16.79	150.6±22.58	159.9±31.38		
Median (IQR)	168.1 (135.8 – 178.3)	130.9 (119.5 – 146.6)	143.7 (134.1 – 172.3)	169.3 (138.8 – 181.2)		
p_0		<0.001*	0.289	1.000		
Sig. bet. periods.		p_1=0.001*, p_2=0.001*, p_3=0.013*				

SD: Standard deviation

F: F test (ANOVA) with repeated measures, Sig. bet. periods was done using Post Hoc Test (adjusted Bonferroni)

p: p value for comparing between the studied periods

p_0: p value for comparing between Before and each periods

p_1: p value for comparing between 1 Month and 3 Months

p_2: p value for comparing between 1 Month and 6 Months

p_3: p value for comparing between 3 Month and 6 Months

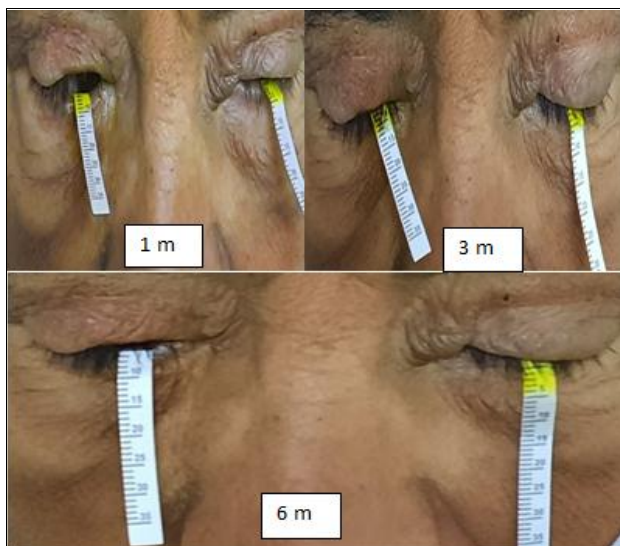*: Statistically significant at $p \leq 0.05$

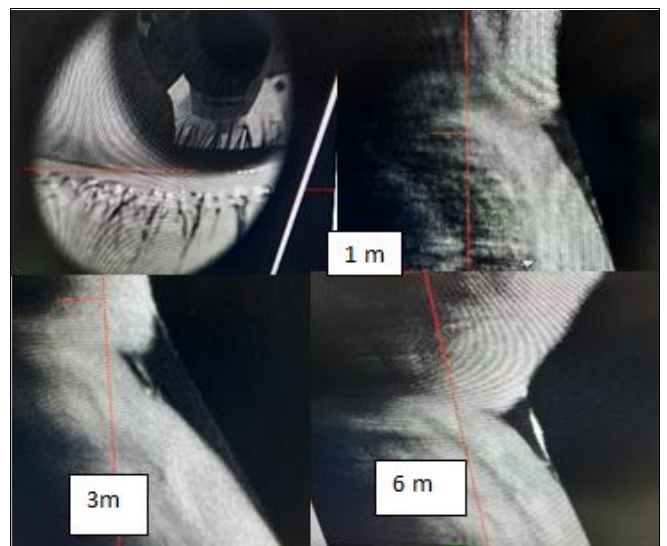**Fig 1:** schirmer test 1, 3, 6 months post-operative

Fig 2: tear meniscus OCT 1, 3, 6 months post-operative

Conclusion
Upper eye lid blepharoplasty effects on the ocular surface and tear film stability. The tear meniscus height, depth, and cross-section area values and dry eye tests except the ocular surface staining decreased significantly at 1 month postoperatively, then started to increase after 3 months postoperative and returned like preoperative after 6 months.

Conflict of Interest
Not available

Financial Support
Not available

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