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Evaluation of Meibomian Gland Dysfunction Before and After Surgical Correction of Cicatricial Entropion of the Upper Eye Lid

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Background: The malfunctioning of the meibomian glands (MGD) is one of the most important causes of dry eye. MGD refers to a set of disorders characterised by functional abnormalities of the Meibomian gland. This study's objective was to assess meibomian gland dysfunction before and after surgical correction of cicatricial entropion of the upper eyelid using two distinct techniques: Tarsal fracture technique and anterior lamellar reposition with grey line split technique.
Methods: This randomized study included thirty consecutive eyes who were randomly divided into two equal groups according to the surgical technique: group (A) that included cases who underwent tarsal fracture technique and group (B) that included cases who underwent anterior lamellar reposition with gray line split technique. Patients were subjected to complete history taking, Ophthalmic examination, Assessment of the visual acuity (VA), Slit lamp bio-microscopy,

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Measurement of intraocular pressure (IOP), Posterior segment examination, Assessment of dry eye.
Results: The preoperative TBUT was insignificant between group A and group B (p=0.689). The preoperative meibography was insignificant between the group A and group B (p=0.992). The mean postoperative TBUT after 1month in group A was 8 ± 2.38 seconds while in group B was 8.50 ± 2.72 seconds with no statistically significant difference between the two groups (p=0.596). The mean postoperative meibography (meibomain gland dropout percentage) after 1month in group A was 51.27 ± 15.69 while in group B was 49.85 ± 19.19 with no statistically significant difference between the two groups (p=0.825).
Conclusions: Meibomain gland dropout by meibography and TBUT increased postoperatively in both group A and group B but more in group A with no statistically significant difference due to small number of cases. Cicatrcial entropion of upper eye lid can be corrected effectively by two different types of surgery: tarsal fracture technique and anterior lameller reposition. Infrared meibography is a good indicator of diagnosis of MGD.

Keywords: Meibomian gland dysfunction; surgical correction; cicatricial entropion; upper eye lid.

1. INTRODUCTION

"Upper eyelid entropion is an eyelid malposition in which the upper eyelid margin is turned inward against the globe. It can cause ocular morbidity. It is an uncommon condition in the western World, in contrast to a number of the developing countries, where trachoma is endemic" [1].

"Cicatricial entropion is produced when there is a vertical shortening of the tarsus secondary to scarring of ocular tissue brought about by disorders such as trachoma, Steven-Johnson syndrome, ocular cicatricial pemphigoid, herps zoster, trauma, chemical injuries, or thermal burnies" [2].

"The meibomian gland dysfunction (MGD) is one of the most important causes of dry eye.

MGD is a term used to describe a group of disorders linked by functional abnormality of Meibomian gland. MDG can lead to altered tear film composition, ocular surface disease, ocular and eye discomfort, and evaporative dry eye" [3-5].

"Meibomian gland dysfunction is a chronic, diffuse, abnormality of the meibomian gland, commonly characterized by terminal duct obstruction, and or qualitative/quantitative changes of glandular secretions. This may result in alteration of tear film, symptoms of eye irritation, clinically apparent inflammation and ocular surface disease" [6].

Patient may have original pathology of MGD before surgery. Preoperative Evaluation of the patient detect degree of MGD. Post operative Evaluation will detect if MGD improved or get worse [7].

Transverse tarsal incision during surgical correction of upper lid entropion by tarsal fracture technique may interrupt the meibomian gland running in tarsal plate and affect the tear film stability [8].

This study's objective was to assess meibomian gland dysfunction before and after surgical correction of cicatricial entropion of the upper eyelid using two distinct techniques: tarsal fracture technique and anterior lamellar reposition with grey line split technique.

2. METERIALS AND METHODS

This study aimed to examine meibomian gland dysfunction prior to and after surgical correction of cicatricial entropion of the upper eyelid using two distinct techniques: tarsal fracture technique and anterior lamellar reposition with grey line split technique.

The cases were randomly divided into two equal groups according to the surgical technique using the closed envelope technique. The numbers from 1 to 30 were written in flat pieces of papers and put in closed envelopes that were randomly distributed to the participants. The cases with the odds number were allocated to group A while the cases with the even numbers were allocated to group B. Group (A): Included fifteen eyes with moderate cicatricial entropion who underwent tarsal fracture technique. Group (B): Included fifteen eyes with moderate cicatricial entropion who underwent anterior lamellar reposition with gray line split technique.

All patients were treated to: a) a comprehensive history, including a review of their general history; (Personal demographic data, Complaint and present history and Medical and family history). Ophthalmic background (History of ocular trauma and ocular surgery). The history of the current ailment, including the patient's initial complaint, the onset and duration of the illness, and its progression.

Grading Score: Staining is represented by punctate dots on a series of panels (A-E). Staining ranges from 0-5 for each panel and 0-15 for the total exposed inter-palpebral conjunctiva and cornea. The dots are ordered on a log scale [9].

2.1 Investigation

Meibography: Using CSO Sirius® Pentacam device designed by C.S.O Italia, Florence. (Fig. 1), with the Phoenix-Meibography Imaging software module.

Patient position: The patient is instructed to fixate straight ahead on the fixation target while seated with his or her chin on the chinrest and forehead on the forehead strap (blue circular ring).

Technique: The measurements were conducted in accordance with the manufacturer's instructions. Using a guided tridimensional manual acquisition and a central fixation light, the device was brought into focus, and an acquisition was made when the instrument displayed a green light.

Results: The MGs that did not transvere the total tarsal plate were indicated as a “dropout.” The Phoenix software gave the measurements of the dropout by percentage, as well as grouped the dropout by a scale within the area, which was highlighted by the users’ free-hand tool: grade 0, no loss at all; grade 1, ≤25%; grade 2, 26%–50%; grade 3, 51%–75%; and grade 4, greater than 75% [10].

Meibography by lid transillumination (standard meibography): “Meibography was performed, similarly to others, by using a transillumination device for vitrectomy with a fiberoptic light source (Millenium system, Bausch & Lomb®, San Leandro, CA, USA) with a 20-gauge disposable fiber light guide” [11].

2.2 Treatment of Cicatrcial Entropion

Surgical techniques: A) Tarsal fractures technique: The procedure was performed under local anaesthetic by local infiltration of 2% lidocaine and 1:100,000 epinephrine. The lid border was sutured with 4/0 silk sutures to create traction sutures. The skin was incised 4 mm above the lid edge. The orbicularis was dissected to expose the tarsus. Skin is closed using interrupted vicryl 6/0 sutures. Six weeks of topical antibiotics and steroid ointment after surgery, followed by one week of systemic antibiotics and anti-inflammatory. B) Anterior lamellar reposition technique: The procedure was performed under local anaesthetic with the infiltration of 2 percent lidocaine and 1:100,000 epinephrine. The eyelid edge is incised with a grey line posterior to the aberrant eyelash, from the lateral commissure to the lacrimal punctum. Then, the superior tarsal margin is dissected. The anterior lamella (skin and muscle flap) was then recessed and fixed to tarsus 4 mm above the lid margin with 6-0 Vicryl horizontal mattress sutures. Six weeks of topical antibiotics and steroid ointment after surgery, followed by one week of systemic anti-inflammatory and antibiotics. Postoperative imaging of the meibomain gland with meibography performed one month after surgery using the same equipment and methodology.

2.3 Statistical Analysis

SPSS v26 was used to perform statistical analysis (IBM Inc., Chicago, IL, USA). Comparing the two groups using an unpaired Student's t- test, quantitative variables were provided as mean and standard deviation (SD). When applicable, qualitative variables were given as frequency and percentage (percent) and examined using the Chi-square test or Fisher's exact test. A two-tailed P value less than or equal to 0.05 was deemed statistically significant.

3. RESULTS

There were no statistically significant differences between the two groups in terms of patient demographics, related comorbidities, or ocular lateralization.

In group A, there were 5 eyes (26.3%) with mild entropion, 9 eyes (47.4%) with moderate entropion and 4 eyes (26.3%), while in group B, there were 5 eyes (25%) with mild entropion, 11 eyes (55%) with moderate entropion and 4 eyes (20%) with severe entropion with no statistically significant difference between the two groups (p= 0.384). In group A, there were 5 eyes (26.3%) with mild MGD, 11 eyes (57.6%) with moderate MGD and 3 eyes (15.8%) with severe MGD,

while in group B, there were 6 eyes (30%) with mild entropion, 10 eyes (50%) with moderate entropion and 4 eyes (20%) with severe MGD with no statistically significant difference between the two groups (p= 0.258).

The mean preoperative TBUT in group A was 9.87 ± 2.45 seconds while in group B was 10.27 ± 2.95 seconds with no statistically significant difference between the two groups (p=0.689). The mean preoperative meibography in group A was 45.10 ± 15.22(percentage of gland loss) while in group B was 45.04 ± 18.73 with no statistically significant difference between the two groups (p=0.992) Table 3 and Fig. 1.

The mean postoperative TBUT after 1month in group A was 8 ± 2.38 seconds while in group B was 8.50 ± 2.72 seconds with no statistically significant difference between the two groups (p=0.596). The mean postoperative meibography after 1month in group A was 51.27 ± 15.69 while in group B was 49.85 ± 19.19 with no statistically significant difference between the two groups (p=0.825).

Table 1. Demographic data and comorbidities in the two study groups

Items	Group A (n= 15)	Group B (n= 15)	p-value
Age (years)	72.80 ± 6.70	71.93 ± 7.06	t = 0.345 P= **0.733**
Sex			
Male	5 (33.3%)	6 (40%)	χ2= 0.495
Female	10 (66.7%)	9 (60%)	P = 0.571
Comorbidities			
DM	5 (33.3%)	3 (20%)	MC = 1.127
HTN	5 (33.3%)	5 (33.3%)	P = 0.461
DM + HTN	2 (13.3%)	3 (20%)	
Laterality of eyes affection			
Unilateral	11 (73.3%)	10 (66.7%)	FET = 0.159
Bilateral	4 (26.7%)	5 (33.3%)	P = 0.690

t: Independent samples, t-test χ2: Chi-square test, MC: Monte-Carlo test, FET: Fischer's exact test

Table 2. Grading of entropion and grading of MGD in the eyes of the two study groups

Grading of entropion	Group A (n= 19)	Group B (n= 20)	p-value
Mild	5 (26.3%)	5 (25%)	MC = 1.706
Moderate	9 (47.4%)	11 (55%)	P = 0.384
Severe	4 (26.3%)	4 (20%)	
Grading of MGD			
Mild	5 (26.3%)	6 (30%)	MC = 1.528
Moderate	11 (57.6%)	10 (50%)	P = 0.258
Severe	3 (15.8%)	4 (20%)	

MC: Monte-Carlo test

Table 3. Preoperative tear break up time and meibography in the two study groups

Items	Group A (n= 19)	Group B (n= 20)	p-value
Tear break up time	9.87 ± 2.45	10.27 ± 2.95	t = -0.404 P= **0.689**
Meibography	45.10 ± 15.22	45.04 ± 18.73	z = 0.010 P= 0.992

t: independent samples t-tests z: Mann-Whitney test

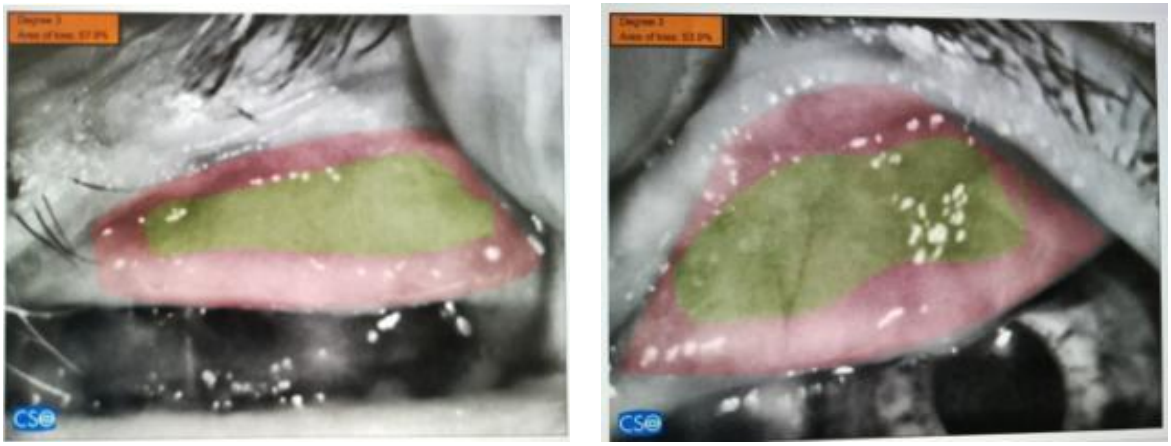

Fig. 1. Preoperative and postoperative meibography

Table 4. 1-month post-operative tear break up time and meibography in the two study groups

Items	Group A (n= 19)	Group B (n= 20)	p-value
Tear break up time	8 ± 2.38	8.50 ± 2.72	t = -0.536 P= **0.596**
Meibography	51.27 ± 15.69	49.85 ± 19.19	z = 0.223 P= 0.825

t: independent samples t-tests, z: Mann-Whitney test

The mean preoperative TBUT in group A was 9.87 ± 2.45 seconds while the mean postoperative TBUT was 8 ± 2.38 seconds. There is high statistically significant decrease in the TBUT postoperative as compared with preoperative value. The mean preoperative meibography in group A was 45.10 ± 14.22 while the mean postoperative meibography was 51.27 ± 15.69. There is high statistically significant increase in the meibography postoperative as compared with preoperative value.

The mean preoperative TBUT in group B was 10.27 ± 2.95 seconds while the mean postoperative TBUT was 8.50 ± 2.72 seconds. There is high statistically significant decrease in the TBUT postoperative as compared with preoperative value. The mean preoperative meibography in group B was 45.04 ± 18.73 while the mean postoperative meibography was 49.85 ± 19.19. There is high statistically significant increase in the meibography postoperative as compared with preoperative value.

Table 5. Comparing between preoperative and postoperative tear break up time and meibography in group A

Items	Preoperative (n= 19)	Postoperative (n= 19)	p-value
Tear break up time	9.87 ± 2.45	8 ± 2.38	t = 24.357 P < 0.001*
Meibography	45.10 ± 14.22	51.27 ± 15.69	t = -18.303 P < 0.001*

*t: Paired samples t-tests, z: Wilcoxon Signed rank test, *: Statistically significant (p<0.05)*

Table 6. Comparing between preoperative and postoperative tear break up time and meibography in group B

Items	Preoperative (n= 20)	Postoperative (n= 20)	p-value
Tear break up time	10.27 ± 2.95	8.50 ± 2.72	t = 18.412 P < 0.001*
Meibography	45.04 ± 18.73	49.85 ± 19.19	z = -13.002 P < 0.001*

*t: Paired samples t-tests, z: Wilcoxon Signed rank test, *: Statistically significant (p<0.05)*

Table 7. Percent of change in TBUT and Meibography in the two study groups

Items	Group A (n= 19)	Group B (n= 20)	p-value
Percent of change of tear break up time (%)	19.81± 5.21	17.72 ± 3.50	t = 1.290 P = 0.208
Percent of change of Meibography (%)	14.85 ± 4.62	12.23 ± 5.04	z = -1.484 P = 0.149

t: independent samples t-tests z: Mann-Whitney test

The percent of change in the TBUT in group A showed a decrease by 19.81± 5.21 that was higher as compared with group B, but it didn't achieve a statistically significant difference 17.72 ± 3.50 (p=0.208). The percent of change in the meibography in group A showed an increase by 14.85 ± 4.62 that was higher as compared with group B, but it didn't achieve a statistically significant difference 12.23 ± 5.04 (p=0.149).

4. DISCUSSION

"Cicatricial entropion of the upper lid is caused by vertical tarsoconjunctival contracture that leads to inward rotation of the lid margin resulting in ocular irritation by the inward turning of the eyelashes or keratinized lid margin causing corneal ulcerations and opacifications" [12].

In the current study, the average age of cases in group A is 72.80 6.70 years and the average age of cases in group B is 71.93 7.06 years, with no statistically significant difference between the two groups (p=0.733). There is no statistically significant difference between the two groups (p=0.571), with 5 males (33.3 percent) and 10 females (66.7 percent) in group A and 6 males (40 percent) and 9 females (60 percent) in group B.

There is higher female predominance in the current study. This came in agreement with [13] who included "20 upper eyelids of 20 patients with recurrent upper lid entropion. These patients were randomly divided into two groups with follow up period for at least 6 months post-operative. Group A: 10 upper eyelids underwent anterior lamellar recession. Group B: 10 upper eyelids underwent tarsal fracture and marginal rotation. These patients were 8 males (40%) and 12 females (60%). Age ranged from 45 to 80 years with an overall mean age of 62.5 years". There was no statistically significant difference between the two groups as regarding the age and sex like our current study.

This also came in accordance with [14] who showed that among the cases with cicatricial entropion included in their study, there are 73.3% females and 26.7% males.

In the current study, there is no statistically significant difference in the type of entropion between the cases in the two study groups. The highest percentage of the cases had moderate entropion that represented 47.4% and 55% in group A and group B respectively.

This was in the same line with El Samkary et al. [15] who included 20 cases with upper eyelid entropion. Among them, there are 6 cases (30%) with mild entropion and 14 cases (70%) with moderate entropion.

"Anterior lamellar reposition with lid margin splitting keeps the integrity of the meibomian gland and avoids following iatrogenic dry eye, this seems especially important in trachoma trichiasis cases" [16].

In the current study, there is no statistically significant difference in the mean TBUT and meibography both preoperative and postoperative between two groups of two types of surgery.

On the same way, there is high statistically significant decrease in the TBUT postoperative as compared with preoperative value and there is high statistically significant increase in the meibography postoperative as compared with preoperative value in both groups.

The percent of change in both parameters was higher in group A, yet it didn't reach a statistically significant value.

Previous research by Aric vaidya et al. [17] indicates that "meibomain gland dysfunction does not resolve following surgical correction of involutional entropion, presumably due to irreversible alterations in eye lid margin and meibomain gland loss." This may correspond to our research.

On the other hand, there is a study published in British Journal of ophthalmology show that after surgical management of upper eye lid entropion most tear films clinically improved, but 60% of patients require no addition tear product they

use. This may mismatch with our study which shows that meibomain gland dysfunction become more worse postoperatively.

According to the study by Samia-Aly et al., simple anterior lameller repositioning, which is used to treat cicatrical entropion, can provide symptomatic relief to individuals with meibomian gland inversions due to meibomian gland dysfunction when all medical treatments fail. This is the first case series that describes the use of this straightforward surgical procedure in the management of this subgroup of patients. This contradicts what we discovered in our research.
There were several limitations to this study. First, the sample size was small. Larger numbers of subjects will give much better result. However, as there was little variation of the results among the eyelids, our results can considered clinically valid.

Secondary, follow up period of the patients was comparatively shorter, as long follow up time could have given much clearer ideas about the surgery effect.

5. CONCLUSIONS

Cicatrcial entropion of upper eye lid can be corrected effectively by two different types of surgery: tarsal fracture technique and anterior lameller reposition. Infrared meibography is a good indicator of diagnosis of MGD. Preoperative and postoperative meibography of meibomain gland and break up time test show that there is slightly increase in meibomain gland dysfunction postoperatively due to breakdown of some meibomain glands. Meibomain gland dysfunction was more in group A with tarsal fracture technique than in group B.

ETHICAL APPROVAL AND CONSENT

The study was done after being approved from the institutional ethical committee, Tanta University. Written informed consent was obtained from all the participants included.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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