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Clinical Evaluation of Changes in Ocular Surface Integrity after Upper Eye Lid Entropion Surgery

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Abstract

Background: Entropion is a common misalignment of eyelids where the border of the eyelid turns inward or inverts. It is more likely to develop in an older person. Trivially more people experience bilateral sickness than unilateral. Since women typically have smaller tarsal plates than men, it is believed that entropion occurs more commonly in women.Aim and objectives: To assess the impact of entropion operation on corneal health by evaluating the condition of the surface epithelium, tear film stability & visual acuity. Patients & methods: This cohort prospective trial was performed on 11 individuals (20 eyes) who underwent upper eye lid entropion surgery in the Ophthalmology Department at Benha University Hospitals. Results: There was a highly significant (p-value < 0.001) decreased percentage of positive fluorescein after surgery (1 patient, 5%) when compared with fluorescein before surgery (20 patients, 100%). Also, there was a highly statistically significant (p-value < 0.001) increased tear break up time (TBUT) after surgery {mean = 7.85 ± 2.4, median = 7 (6.25 – 8)} when compared with TBUT before surgery {mean = 5.0 ± 1.4, median = 5 (4 – 6.75)}.Conclusion: Our study demonstrated a noticeable enhancement in ocular surface integrity, including decreased corneal irritation, alleviated symptoms of discomfort, and improved tear film stability after the entropion repair procedure. These outcomes indicate a positive effect on the overall health and stability of the eye's surface subsequent to surgical intervention for upper eyelid entropion.

Key words: Entropion, Ocular surface integrity, Tear film stability

1.Introduction

The inward tilting or inversion of the eyelid edge is known as entropion. This is a frequent misalignment of the eyelids. Corneal abrasions, corneal thinning, scarring, or neovascularization can result from corneal & conjunctival injury caused by this misposition (1).

Entropion is more likely to develop in an older person. Trivially more people experience bilateral sickness than unilateral. Since women typically have smaller tarsal plates than men, it is believed that entropion occurs more commonly in women (1).

Trachomatous trichiasis is the result of multiple infections from childhood with Chlamydia trachomatis, which causes recurrent chronic inflammation in the tarsal conjunctiva. This produces conjunctival scarring, entropion, trichiasis, and ultimately blinding corneal opacification. Scar tissue contracts leading to in-turning of the lid, causing entropion, and this entropion eventually leads to trichiasis. Entropion is the most common cause of trichiasis in trachoma patients. (2)

In several regions of the Middle East and Africa, trachoma is the most common cause of upper eyelid cicatricial entropion (UCE) (3).

Because of the cicatrizing as well as chronic inflammatory effects on the conjunctival epithelium, trachoma compromises the stability of the tear film by interfering with the secretion of both water and mucus. Trichiasis, which causes infectious corneal ulcers & recurrent corneal epitheliopathy, as well as faulty tears, are other causes of its blinding impact on the cornea (4).

Correction of upper eyelid entropion with tarsal rotation operation involves fixation of the eyelid and incision through all layers parallel to the lid margin, and resuturing so that the lid margin is rotated outwards, and the eyelashes are no longer in contact with the cornea (5).

Lubrication of the eyes, artificial tears, or contact lenses are common medical treatments. To prevent harm to the eye surface caused by inflamed eyelashes, these might be utilized (6,7).

The aim of this study was to assess the impact of entropion correction operation on corneal health by evaluating the condition of the surface epithelium, tear film stability & visual acuity.

2.Patients & methods:

This cohort prospective trial was done on 11 cases (20 eyes) who underwent upper eye lid entropion surgery in the Ophthalmology Department at Benha University Hospitals.

I.Inclusion criteria: Age > 40 years old, both sexes, cases of mild-to-moderate upper eye lid entropion including cases with cicatricial marginal entropion.

II.Exclusion criteria: Recurrent entropion, severe entropion with marked tarsal shortening, patients with ocular surface disorders e.g., ocular cicatricial pemphigoid, Stevens-Johnson syndrome & chemical burns.

III.Study methods:

All patients of this study were subjected to under local infiltrative anesthesia & surface anesthesia. Three traction eye lid sutures were placed by 4/0 silk. The eyelid was everted over an eyelid spatula and marking for incision 4 mm from lash line. The tarsus was incised full thickness. The base was identified by pink orbicularis. The first cardinal suture was taken centrally using 5/0 Vicryl through the proximal strip of tarsus then under the distal strip of tarsus to emerge through the skin just above the lash line. A free needle is used to thread another end of suture in a similar fashion. Two other cardinal sutures were taken similarly on either side of the central suture. The end point was mild over correction on the table which gets corrected with time. For one week, every individual was given systemic antibiotics & another week of antibiotic eye drops. The sutures were allowed to dissolve on their own unless an infection developed.

IV.Outcome of the procedure was assessed as following:

Best-corrected visual acuity (BCVA) was recorded before and after operation in these patients. Visual Acuity was graded, according to the definition given by WHO, into low vision (BCVA <6/18 but ⩾3/60 in the better eye) and blindness (BCVA <3/60 in the better eye) and logMAR value. Corneal fluorescein staining was carried out before and after and the area of staining was recorded diagrammatically in all cases. It was graded from 0 to 2, where 0=no stain; 1=superficial punctate staining of ⩽half of the corneal surface; and 2=more than half of the surface took up the stain. To reduce bias, the observer was masked to previous corneal drawings at subsequent follow-up visits. Tear film break up time (TBUT), Schirmer I test (using Whatman number 41 filter paper) were performed and the results recorded. Central corneal epithelial thickness was measured before and after surgery.

V.Statistical analysis:

Data were analyzed using Statistical Program for Social Science (SPSS) version 24. Qualitative data were expressed as frequency and percentage. Quantitative data were expressed as mean ±SD and median (IQR). Mean (average): the central value of a discrete set of numbers, specifically the sum of values divided by the number of values. Standard deviation (SD): is the measure of dispersion of a set of values. A low SD indicates that the values tend to be close to the mean of the set, while a high SD indicate that the values are spread out over a wider range. Median: The middle number; found by ordering all data points and picking out the one in the middle (or if there are two middle numbers, taking the mean of those two numbers). IQR (inter-quartile range): is a measure of statistical dispersion, which is the spread of the data. It is defined as the difference between the 75th and 25th percentiles of the data. The following tests were done: Mann Whitney U test (MW): when comparing between two groups (for abnormally distributed data). Chi-square test: was used when comparing between non-parametric data. Pearson's correlation coefficient (r): test was used for correlating data. Probability (P-value): P-value < 0.05 was considered significant, P-value < 0.001 was considered as highly significant and P-value > 0.05 was considered insignificant.

Ethical consideration: All patients were subjected to informed written consent. The trial was approved by the Ethical Committee of Benha University (MS 37-10-2021)

3.Results:

Table (1) Description of demographic data in all studied patients.

		Studied patients (n = 11 patients)	
Sex	**Male**	3	27.3%
	Female	8	72.7%
Age (years)	**Mean ±SD**	63.3 ± 7.7	
	Min - Max	53 – 79	
Laterality	**Unilateral**	2	18.2%
	Bilateral	9	81.8%
Affected eye (n = 20 eyes)	**Right eye**	11	55%
	Left eye	9	45%

Table 1 showed that 2 out of 11 patients (18.2%) were unilaterally affected and 9 patients (81.8%) were bilaterally affected. Eleven (55%) were right eyes & 9 (45%) were left eyes. In terms of age, the mean age of all participated persons was 63.3 ± 7.7 years. As regard gender, there were 3 males (27.3%) & 8 females (72.7%) in the studied patients.

Table (2) Comparisons of BCVA (log mar) before and after surgery.

		Before (n = 20 eye)	After (n = 20 eye)	MW	P-value
BCVA (log mar)	**Mean ±SD**	0.68 ± 0.16	0.64 ± 0.13	173	0.478 NS
	Median (IQR)	0.6 (0.6 – 0.8)	0.6 (0.52 – 0.8)		

X^2: Chi-square test, NS: p-value > 0.05 is considered non-significant.

Table 2 showed that there was no statistically significant alteration (p-value = 0.478) of best-corrected visual acuity (LogMAR) before & after surgery. Before operation, mean BCVA was 0.68 ± 0.16 and the median was 0.6 (0.6 – 0.8) while after surgery, the mean best-corrected visual acuity was 0.64 ± 0.13 as well as median was 0.6 (0.52 – 0.8).

Table (3) Comparisons of Fluorescein before and after surgery.

		Before (n = 20 eye)		After (n = 20 eye)		Stat. test	P-value
Fluorescein	**Negative**	0	0%	19	95%	**X^2 = 36.2**	**< 0.001 HS**
	Positive	20	100%	1	5%		

Table 3 indicated highly significant (p-value < 0.001) decreased percentage of positive fluorescein after surgery (1 patient, 5%) when compared with fluorescein before surgery (20 patients, 100%).

Table (4) Comparisons of TBUT before and after surgery.

		Before (n = 20 eye)	After (n = 20 eye)	MW	P-value
TBUT	**Mean ±SD**	5.0 ± 1.4	7.85 ± 2.4	**42.5**	**< 0.001 HS**
	Median (IQR)	5 (4 – 6.75)	7 (6.25 – 8)		

MW: Mann Whitney U test. HS: p-value < 0.001 is considered highly significant.

Table 4 showed highly statistically significant (p-value < 0.001) increased tear break up time (TBUT) after surgery {mean = 7.85 ± 2.4, median = 7 (6.25 – 8)} when compared with TBUT before surgery {mean = 5.0 ± 1.4, median = 5 (4 – 6.75)}.

Table (5) Comparisons of Schirmer before and after surgery.

		Before (n = 20 eye)	After (n = 20 eye)	MW	P-value
Schirmer	**Mean ±SD**	11.2 ± 7.8	20.1 ± 3.8	**66**	**< 0.001 HS**
	Median (IQR)	7.5 (4.25 – 17)	20 (17 – 22.75)		

Table 5 exhibited highly statistically significant (p-value < 0.001) increased Schirmer after surgery {mean = 20.1 ± 3.8, median = 20 (17 – 22.75)} when compared with Schirmer before surgery {mean = 11.2 ± 7.8, median = 7.5 (4.25 – 17)}.

Table (6) Comparisons of CCET before and after surgery.

		Before (n = 20 eye)	After (n = 20 eye)	MW	P-value
CCET	**Mean ±SD**	55.4 ± 4.74	52.5± 4.81	1.92	0.06NS
	Median (IQR)	55 (53 – 56)	51.5 (50– 52)		

Table 6 displayed no statistically significant alteration (p-value = 0.06) of CCET before & after surgery. Before surgery, mean CCET was 55.4 ± 4.74and median was 55 (53 – 56) while after surgery, mean CCET was 52.5± 4.81and median was 51.5 (50– 52).

Table (7) Correlation of study parameters before and after surgery.

Before surgery	TBUT		Schirmer		CCET	
	r	p-value	r	p-value	r	p-value
TBUT	----	----	0.49	0.026 S	0.322	0.36NS
Schirmer	0.49	0.026 S	----	----	0.289	0.418NS
CCET	0.322	0.36NS	0.289	0.418NS	----	----
After surgery						
TBUT	----	----	- 0.06	0.779 NS	- 0.362	0.303NS
Schirmer	- 0.06	0.779 NS	----	----	0.047	0.896NS
CCET	- 0.362	0.303NS	0.047	0.896NS	----	----

(r): Pearson correlation coefficient, S: p-value < 0.05 is considered significant, NS: p-value > 0.05 is considered non-significant.

As regard correlations before surgery, there was: Statistically significant positive correlation between TBUT and Schirmer (p-value = 0.026 r = 0.49) and no significant correlation between TBUT and CCET (p-value = 0.36 r = 0.322) and between Schirmer and CCET (p-value = 0.418 r = 0.289). As regard correlations after surgery, there were: No statistically significant negative correlation between TBUT and Schirmer (p-value = 0.779 r = - 0.06) and between TBUT and CCET (p-value = 0.303 r = -0.362). There was no statistically significant positive relationship among Schirmer & CCET (p-value = 0.896 r = 0.047) **(Table 7).**

4.Discussion

Trachoma, causing cicatricial entropion and trichiasis, is a common cause of blindness in Africa, Asia, and South America. Timely lid surgery can prevent corneal scarring. The type of surgery depends on the severity of entropion in the eyelid. Procedures for trachomatous entropion include terminal tarsal rotation, tarsal rotation with posterior lamellar advancement, and anterior lamellar repositioning with lid margin split and wedge resection. Comparing these procedures can help identify the most effective anatomical and cosmetic correction with the lowest recurrence and complication rates. [8]

Our study showed that 2 out of 11 patients (18.2%) were unilaterally affected and 9 patients (81.8%) were bilaterally affected. Eleven (55%) were right eyes and 9 (45%) were left eyes. As regard age, the mean age of all studied cases was 63.3 ± 7.7 years. As regard sex, there were 3 males (27.3%) in addition to 8 females (72.7%) in the studied persons.

In agreement with our results, **Monga et al.,** who sought to ascertain the impact of entropion surgery on corneal health as it pertains to surface epithelium, stability of the tear film, change in curvature, as well as vision. The age range of the fifty-one individuals (fifty-one eyes) in their study was 32–75 years old, with an average age of 59.17± 10.65. In all, 36 females & fifteen males were treated [8].

In our trial, we found that there was no significant alteration (p-value = 0.478) of BCVA (LogMAR) prior to and following operation. Prior to the procedure, mean Best-corrected visual acuity was 0.68 ± 0.16 & median was 0.6 (0.6 – 0.8) while after surgery, mean BCVA was 0.64 ± 0.13 and median was 0.6 (0.52 – 0.8).

In consistent with our results, **Singh et al.,** they determined that among those who had a single-staged surgical correction for cicatricial entropion, along with lid margin mucous membrane grafting for lid margin keratinization, fifty percent of the eyes (n = 13) demonstrated improvement in postoperative visual acuity, 39 percent of the eyes (n = 10) revealed no improvement, as well twelve percent of the eyes (n = 3) experienced worsened vision [9].

In our research, we reported that there was highly statistically significant (p-value < 0.001) decreased percentage of positive fluorescein after surgery (1 patient, 5%) when compared with fluorescein before surgery (20 patients, 100%).

In consistent with our results **Iyer et al.,** they noticed that researchers examined the impact of SJS on participants' lid margin keratinization scores by measuring the change in total fluorescein corneal staining scores following surgery. In everyone's opinion, the score went up. In 17 eyes (33.33%), the staining score rose to above 6, in 27 eyes (52.94%), as well as 13 eyes (13.73%) [10].

In our findings, there was a highly statistically significant improvement in TBUT after surgery {mean = 7.85 ± 2.4, median = 7 (6.25 – 8)} when compared with TBUT before surgery {mean = 5.0 ± 1.4, median = 5 (4 – 6.75)}.

Lee et al., examined 20 patients who underwent upper lid entropion correction surgery using a modified Quickert's procedure. The study found that there was a significant enhancement in dry eye symptoms after surgery as measured by Schirmer's test & tear film breakup time [11].

In the present study, we revealed that there was a significant increase in Schirmer after surgery {mean = 20.1 ± 3.8, median = 20 (17 – 22.75)} when compared

with Schirmer before surgery {mean = 11.2 ± 7.8, median = 7.5 (4.25 – 17)}.

In consistent with our results, **Iyer et al.,** they examined the results of the Schirmer I test prior to and after surgery in 54 eyes of 31 patients who had lid border keratinization following SJS. Among patients with recordable data, the percentage of eyeballs with wetness between 5 and 15 mm increased significantly from 27.57% before surgery to 59.45% after [10].

In our findings, there was no statistically significant alteration (p-value = 0.06) of CCET before & after surgery. Before surgery, mean CCET was 55.4 ± 4.74and median was 55 (53 – 56) while after surgery, mean CCET was 52.5± 4.81and median was 51.5 (50– 52).

As regard correlations before surgery, there was: Statistically significant positive correlation between TBUT and Schirmer (p-value = 0.026 r = 0.49) and no significant correlation between TBUT and CCET (p-value = 0.36 r = 0.322) and between Schirmer and CCET (p-value = 0.418 r = 0.289). As regard correlations after surgery, there were: No statistically significant negative correlation between TBUT and Schirmer (p-value = 0.779 r = - 0.06) and between TBUT and CCET (p-value = 0.303 r = -0.362). There was no statistically significant positive relationship among Schirmer & CCET (p-value = 0.896 r = 0.047)

In a study of **Elsamkary et al.,** [12]**,** although the TBUT values varied from 4 to 13 seconds, they were below the values reported by **Monga [8].** However, none of the patients had drying of the conjunctiva or cornea. It is possible that the higher-than-average Schirmer I values made up for the lower TBUT. After surgery, no patient was given eye drops to help keep their eyes moist. Therefore, the removal of aggravating factors (entropion or trichiasis) is directly associated to enhance corneal and conjunctival epithelial integrity, which is likely to explain why TBUT improves following surgery. To assist disperse the tear film uniformly & efficiently, it may have been helpful to properly line the lid margin to the eyeball [12].

5.Conclusion

The data collected and analyzed throughout the study demonstrated a noticeable enhancement in ocular surface integrity, including decreased corneal irritation, alleviated symptoms of discomfort, and improved tear film stability after the entropion repair procedure. These outcomes indicate a positive effect on the overall health and stability of the eye's surface subsequent to surgical intervention for upper eyelid entropion. Furthermore, the study underscores the importance of timely and appropriate management of entropion, as it not only addresses the malposition of the eyelid but also contributes to the restoration of ocular surface health. The findings support the efficacy of upper eyelid entropion surgery as a means to alleviate patient discomfort.

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