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CHANGES IN TEAR FILM OF DIABETIC PATIENTS IN PRE AND POST PHACOEMULSIFICATION: A COMPARATIVE STUDY

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ABSTRACT Phacoemulsification is preferred choice in the management of cataract because of earlier refractive stabilization, reduced astigmatism, and milder postoperative inflammation. After phacoemulsification in diabetic cataract patients, with tear secretion reduction, what worsened in them was worsened dry eye symptoms and predisposed them to ocular damage.

Aim: The aim of this study was to assess the changes of Tear film in diabetic patient's pre and post phacoemulsification.

Methods: Pre and post comparative study. Patients were examined preoperatively. A standard phacoemulsification technique was used beginning with clear corneal incision at 12 o'clock position.

A foldable posterior chamber intraocular lens was implanted in the capsular bag.

Patients were examined on days 1, 7 and 30 postoperatively.

Results: The mean and standard deviation values of TBUT in the preoperative, postoperative day 1, 1 week, 1 month, were 19.36+/-2.41, 19.91+/-1.81, 16.84+/-3.60, 14.04+/-4.04 respectively in the present study.

The mean and standard deviation values of ST in the preoperative, postoperative day 1, 1 week, 1 month, were 17.75+/-2.16,19.40+/-2.38,15.18+/-2.16 and 12.10+/-2.25 respectively in the present study.

Conclusion: This study proved that there exists a significant association between tear film of pre and post phacoemulsification in diabetic patients.

KEYWORDS : phacoemulsification, Tear film, diabetes.

INTRODUCTION

Phacoemulsification is preferred choice in the management of cataract because of earlier refractive stabilization, reduced astigmatism, and milder postoperative inflammation.

After phacoemulsification in diabetic cataract patients, with tear secretion reduction, what worsened in them was worsened dry eye symptoms and predisposed them to ocular damage.

Often, tear film dysfunction associated with surgical procedures remains a major source of dissatisfaction, although most patients achieve excellent postoperative visual acuity.[2,3]

The greater the incision size, slower the recovery of symptoms.[4]

It has been shown that both incidence and severity of dry eye increases, where there have been many complaints from patients of dry eye and symptoms of irritations after cataract surgery. To be precise, after phacoemulsification, there was documentation of the reduction in tear break up time (TBUT)[5].

Diabetes mellitus is condition characterized by increase in blood sugar levels which is chronic disorder and leads top potential disability. These patients were at risk of developing complications including neuropathy, nephropathy and retinopathy. This leads to end stage renal disease, amputation.

The prevalence of diabetes mellitus for all age groups was estimated to be 2.8% in 2000 and may rise up to 4.4% by 2030.[6]

Decrease tear film production was observed in diabetic patients, and numerous studies showed that prevalence of dry eyes varies from 18 to 54%.

Decrease in tear film production was characterized by stinging, sensitivity to light, blurriness, and foreign body sensation and burning.

METHODS AND MATERIALS

Study Design and Setting

Study Design: Pre and post Comparative study, Hospital based.

Study Setting: Department of Ophthalmology, Justice K.S.Hegde Charitable Hospital, a unit of K S Hegde Medical Academy affiliated to Nitte (Deemed to be University).

Study population: Cases of diabetes undergoing phacoemulsification cataract surgery in Ophthalmology Department.

Sample size: 80

The minimum sample size was calculated as 40, considering the difference of 86% change in two groups at 95% confidence interval and 80 % power of the study using the statcalc tool of EpiInfo software version 7.2.

Considering the higher number of case load and to increase the strength of the study, the obtained sample size was doubled and the final sample size for the study was 80.

Sample selection

Selection method: Consecutive and stratified.

Inclusion criteria: All cataract cases with diabetes mellitus that are undergoing phacoemulsification.

Exclusion criteria:

- Cases of Dry eye syndrome and other systemic disorders like Hypothyroidism, Sjogren's syndrome, Systemic Lupus Erythematosus (SLE), Rheumatoid arthritis (RA).
- Contact lens users.

Study Period: January 2018- June 2019

MATERIAL AND METHOD

Patients were examined preoperatively. A standard phacoemulsification technique was used in the beginning with clear corneal incision at 12 o'clock position.

A foldable posterior chamber intraocular lens was implanted in the capsular bag.

Patients were examined on days1, 7 and 30 postoperatively.

The ocular examinations include**:**

1. Tear film break-up time (TFBUT) measurement:

- The interval between the last blink and the appearance of the first corneal dry spot was measured using blue cobalt filter under wide light.

- Procedure: The patient is seated at the slit lamp. A dry fluorescein strip moistened with paracaine is touched to the inferior fornix with the patient looking up. The cornea is seen under slit lamp using blue cobalt light. The patient is instructed to blink once or twice and then stare straight ahead without blinking. The tear film is observed by moving the beam of the slit lamp from limbus watching for an area of tear film rupture manifested by islands within the green sea of fluorescein. The time elapsed between the last blink and the appearance of first black spot is termed as tear film breakup time and noted in seconds. This kind of measurement is taken for three successive blinks and the mean of this is noted as the final reading.

Interpretation:
TFBUT value less than 10 seconds was considered as abnormal.

2. Schirmer I test (SIT):
- Procedure: It is done using 5x35mm sterile strips of Whatman no.41 filter paper. Patient is made to sit in relatively dark room with fan switched off. The terminal round end of the strip is folded at the pre marked area along 90 degree angle. Touching the paper directly with the finger is avoided in order to avoid contamination of skin oils. The patient is then asked to look up, lower lid retracted and the test paper inserted in the lower cul de sac at the junction of medial 2/3rd and the lateral 1/3rd of the lid .Adequate care is taken during the procedure to ensure that the paper did not touch cornea, in order to avoid reflex tearing. The patient is advised to blink normally. At the end of 5 minutes, the strips are removed and the length of filter paper moistened is measured in mm starting from the fold.

Interpretation:
- A reading of less than 10mm was considered as abnormal.

3. Corneal fluorescein staining:
Procedure: The patient is seated at the slit lamp. A dry fluorescein strip moistened with paracaine is touched to the inferior fornix with the patient looking up. The cornea is seen under slit lamp using blue cobalt light. The patient is instructed to blink once or twice and then stare straight ahead without blinking. Staining of the cornea with the fluorescein is noted.

Interpretation:
- Staining in any part of the cornea was considered as abnormal**.**

RESULTS

AGE
In the present study, out of 80 patients studied, 42 patients (52.5%) were between 61 to 70 years, and 26 patients (32.5%) were between the ages of 51-60 years, 9 patients (11.3%) were above 70 years, and 3 patients (3.8%) were below 50 years of age.

Hence, majority (53%) of patients belong to the age group of 61 to 70 years

SEX
In the present Study, 47.5% of patients were females and 52.5% were males.

LATERALITY
In the present study, out of 80 patients studied, 61% of patients had undergone surgery in the left eye, and 39% of patients in the right eye.

COMPARISION OF PRE AND POST PHACOEMULSIFICATION TBUT VALUES

On comparison of the mean values of TBUT PRE and TBUT D1 the mean values of TBUT D1 was higher with a difference of 0.55 is statistically significant with a p value of <0.001.

On comparison of the mean values of TBUT PRE and TBUT D7 the mean values of TBUT PRE was higher with a difference of 2.525 is statistically significant with a p value of <0.001.

On comparison of the mean values of TBUT PRE and TBUT D30 the mean values of TBUT PRE was higher with a difference of 5.325 is statistically significant with a p value of <0.001.

On comparison of the mean values of TBUT D1 and TBUT D7 the mean values of TBUT D1 was higher with a difference of 3.075 is statistically significant with a p value of <0.001.

On comparison of the mean values of TBUT D1 and TBUT D30 the mean values of TBUT D1 was higher with a difference of 5.875 is statistically significant with a p value of <0.001.

On comparison of the mean values of TBUT D7 and TBUT D30 the mean values of TBUT D7 was higher with a difference of 2.8 is statistically significant with a p value of <0.001 as shown in table3.4.

Table 1: Paired't' test for comparison of the any two time periods of TBUT

		N	Mean ± SD	Mean difference ± SD	t	P VALUE
Pair 1	SIT PRE	80	17.75±2.16	-1.65±1.06	-13.97	<0.001
	SIT D1	80	19.4±2.38			
Pair 2	SIT PRE	80	17.75±2.16	2.58±1.32	17.45	<0.001
	SIT D7	80	15.18±2.44			
Pair 3	SIT PRE	80	17.75±2.16	5.65±1.58	31.91	<0.001
	SIT D30	80	12.1±2.25			
Pair 4	SIT D1	80	19.4±2.38	4.23±1.59	23.75	<0.001
	SIT D7	80	15.18±2.44			
Pair 5	SIT D1	80	19.4±2.38	7.3±1.8	36.22	<0.001
	SIT D30	80	12.1±2.25			
Pair 6	SIT D7	80	15.18±2.44	3.08±1.16	23.79	<0.001
	SIT D30	80	12.1±2.25			

COMPARISION OF PRE AND POST PHACOEMULSIFICATION SIT VALUES

On comparison of the mean values of SIT PRE and SIT D1 the mean values of SIT D1 was higher with a difference of 1.65 is statistically significant with a p value of <0.001.

On comparison of the mean values of SIT PRE and SIT D7 the mean values of SIT PRE was higher with a difference of 2.575 is statistically significant with a p value of <0.001.

On comparison of the mean values of SIT PRE and SIT D30 the mean values of SIT PRE was higher with a difference of 5.65 is statistically significant with a p value of <0.001.

On comparison of the mean values of SIT D1 and SIT D7 the mean values of SIT D1 was higher with a difference of 4.225 is statistically significant with a p value of <0.001.

On comparison of the mean values of SIT D1 and SIT D30 the mean values of SIT D1 was higher with a difference of 7.3 is statistically significant with a p value of <0.001.

On comparison of the mean values of SIT D7 and SIT D30 the mean values of SIT D7 was higher with a difference of 3.0 is statistically significant with a p value of <0.001 as shown in table 3.5.75

Table 2: Paired 't' test for comparison of the any two time periods of SIT

		N	Mean ± SD	Mean difference ± SD	t	P VALUE
Pair 1	TBUT PRE	80	19.36±2.41	-0.55±1.25	-3.93	<0.001
	TBUT D1	80	19.91±1.81			
Pair 2	TBUT PRE	80	19.36±2.41	2.53±2.5	9.03	<0.001
	TBUT D7	80	16.84±3.6			
Pair 3	TBUT PRE	80	19.36±2.41	5.33±2.64	18.06	<0.001
	TBUT D30	80	14.04±4.04			
Pair 4	TBUT D1	80	19.91±1.81	3.08±2.85	9.64	<0.001
	TBUT D7	80	16.84±3.6			
Pair 5	TBUT D1	80	19.91±1.81	5.88±3.02	17.42	<0.001
	TBUT D30	80	14.04±4.04			
Pair 6	TBUT D7	80	16.84±3.6	2.8±3.03	8.27	<0.001
	TBUT D30	80	14.04±4.04			

COMPARISON OF THE CATEGORICAL VARIABLES
In the present study, all patients had clear cornea preoperatively, whereas postoperatively on day 1, 1week and 1-month corneal fluorescein staining was present in 100%, 5% and 15% of patients respectively

DISCUSSION

The symptoms of discomfort, visual disturbances, and tear instability with potential damage to the ocular surface were resulted by Dry eye disease which is a multifactorial disease of the tear film and ocular surface. Hence, International Dry Eye Workshop described that increased osmolarity of the tear film and inflammation of the ocular surface was accompanied by the dry eye disease.

When the tear film becomes chronically unstable and repeatedly breaks up into spots between blinks, exposing the corneal and conjunctival epithelium to evaporation, Dry eye produces discomfort and reduced vision. Aqueous deficiency or the natures of evaporation are resulted from the multifactorial disease of tears and ocular surfaces.

T BUT interpretation

In our study, preoperatively all of the patients had T BUT values in the higher range whereas postoperatively patients had lower TBUT values compared to the preoperative condition.

In a study done by Mohan S et al[7], T BUT values were decreased significantly at one week, one month and near normal at three months. Preoperatively the mean ± Standard deviation values of TBUT was 9.48 ±3.212 and post operatively at one week, one month and three months the TBUT values were 7.57±2.285, 6.8± 2.188, 7.5±2.675 respectively. In our study the results showed deterioration of TBUT mean value at one month.

In a study by Srinivasan et al[8] there was a reduction in TBUT values after phacoemulsification in Pseudophakic eyes. In a study TBUT was decreased significantly in postoperative day 30 .In a study done by Ram et al[9] TBUT values were decreased significantly after cataract surgery. In a study by Li XM et al[10] showed decrease in TBUT values after phacoemulsification in high percentage of patients. In a study by Oh T et al[4] postoperatively on day 1 TBUT values were decreased significantly and it had returned to almost to the preoperative level at one-month post-surgery.

In a study by Sitompul et al[11], the mean and standard deviation values of TBUT preoperatively, postoperatively at one week, one month, three months, six months were 11.6 ± 2.3, 7.03± 0.97, 7.42± 0.79,11.76±2.8,12± 2.5 respectively. The TBUT values at one week and one month were decreased significantly compared to post-operative TBUT values at three months and six months.

A study of the incidence and the pattern of dry eye were done after the cataract surgery by Ngamjit Kasetsuwan et al[12]. Preoperatively and postoperatively, the mean TBUT values at 1 week, 1 month and 3 months were 12. 15, 4.59, 5.11 and 5.21 respectively. Interestingly, a marked decrease in the mean TBUT was observed postoperatively.

After evaluation of tear film stability and tear secretion after the cataract surgery, Saif MYS et al[13], found that there was subsequent increase in the mean TBUT value in the 3 months while, the same was decreasing in the 1 week. The mean TBUT values were 12.8+/-2.5, 8.9+/-2.7, 9.9+/-2.8, and 11.15+/-2.8 preoperatively and postoperatively respectively.

The mean and standard deviation values of TBUT in the preoperative, postoperative day 1, 1 week, 1 month, were 19.36+/-2.41, 19.91+/-1.81, 16.84+/-3.60, 14.04+/-4.04 respectively in the present study.

Interestingly, the TBUT values had a marked decrease in 1 week and 1 month, while there was a slight decrease shown in the postoperative condition on day 1.

Schirmer's test interpretation

In our study, preoperatively all the patients had Schirmer's values in the higher range, whereas postoperatively all patients showed decrease in ST values.

In a study done by Srinivasan R et al[8], the values of Schirmer's test showed significant decrease in postoperative cases of cataract cases.

In a study, statistically significant deterioration in the ST values in postoperative period. The mean and standard deviation values of ST at preoperative, postoperative 1 month and 3 months were 17.13+/-4.65,16.54+/-5.23 and 14.54+/-4.53 respectively.

Postoperatively till 4 weeks, significant decrease in the ST values observed by Ram et al, Li et al, Li Zet et al.

In a study by Mohan S et al[7], there was significant decrease in ST values after surgery up to 4 weeks. The mean and standard deviation values of ST in preoperative, postoperative 1 week, 1 month and 3 months were 9.23+/-2.112,7.3+/-2.24,6.6+/-1.754 and 7.83+/-2.036 respectively. These results of marked fall in mean value at 1 month after surgery was consistent with our study.

In a study, the mean ST values preoperatively, postoperatively at 10 days, 1 month and 3 months were 17.46+/-6.15, 14.96+/-7.28, 13.06+/-4.52 and 13.71+/-6.54 respectively. Postoperatively at 1 month, there was marked decrease in ST values. The results were consistent with our study.

In a study by Gharaee et al[14], the mean and standard deviation of ST values preoperatively, postoperatively at 5 days, 10 days, 1 month and 2 months were 17.56+/-6.88,10.4+/-7.5,8.34+/-6.69,9.23+/-6.26 and 12.3+/-5.49 respectively. There was a significant decrease in ST values at 1 month and improvement noted at 2 months.

In a study by Sitompul et al[11], the mean and standard deviation values of ST preoperatively, postoperatively at one week, one month, three months, six months were 6.39+/-1.42,4.45+/-0.95,4.5+/-1.31,6.46+/-1.28 respectively. There was marked decrease in ST values at 1 week and 1 month, later on attained preoperative value at 3 months and 6 months.

A study of the incidence and the pattern of dry eye were done after the cataract surgery by Ngamjit Kasetsuwan et al[12]. Preoperatively and postoperatively, the mean ST values at 1 week, 1 month and 3 months were 14.14, 7.57, 9.83 and 10.25 respectively. Interestingly, a marked decrease in the mean ST was observed postoperatively.

After evaluation of tear film stability and tear secretion after the cataract surgery, Saif MYS et al.[14], found that there was subsequent increase in the mean ST value in the 3 months while, the same was decreasing in the 1 week. The mean ST values were 14.05+/-3.8, 10.2+/-3.2, 11.35+/-3.6, and 12.8+/-3.5 preoperatively and postoperatively respectively.

The mean and standard deviation values of ST in the preoperative, postoperative day 1, 1 week, 1 month, were 17.75+/-2.16,19.40+/-2.38,15.18+/-2.16 and 12.10+/-2.25 respectively in the present study. Interestingly, the ST values had a marked decrease in 1 week and 1 month, while there was slight decrease shown in the postoperative condition on day 1.

Corneal fluorescein staining interpretation

In the present study, all patients had clear cornea preoperatively, whereas postoperatively on day 1,1week and 1 month corneal fluorescein staining was present in 100%, 5% and 15% of patients respectively. In a study, it was shown that the presence of corneal staining in almost all patients postoperatively on day 1, later on it returned to preoperative level by 3 months postoperatively.

CONCLUSION

This study proves that there exists a significant association between tear film of pre and post phacoemulsification in diabetic patients. Phacoemulsification can lead to tear film instability.

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