

Original Paper

Tear Film Instability in Diabetic Patients

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Abstract

Background: The association between dry eye symptoms and ocular surface disease is becoming more frequent. The recent rise in newly diagnosed cases of diabetes mellitus and the awareness of real complaints of diabetic patients from dryness of the eye and ocular discomfort are responsible for the recent increase in the number of patients and frequency of their consultations to the outpatient departments.

Aims of the study: To investigate the changes of tear film and ocular surface in diabetic patients.

Design and method: A case control study carried out in the eye clinic of Al-Sadr Teaching hospital in holy Najaf city for 12 months. It included 100 eyes of fifty patients of Type 2 Diabetes Mellitus (Cases) and 100 eyes of fifty healthy individual (Controls). After exclusion of patients with history of systemic diseases with ocular manifestations affecting tear secretion, abnormalities in the cornea, conjunctiva, or eyelid, and secondary ocular and systemic disease, the remaining diabetic cases are 72 and control cases are 89. Different symptoms included; character of irritation whether it was burning, foreign body sensation or sand gritty feeling. All the individuals underwent routine general physical examination and thorough ophthalmological examination followed by measuring tear film meniscus height, tear film breakup time (BUT), presence or absence of tear film debris.

Results: There is significant difference between diabetics and non-diabetics in presence of normal or abnormal tear meniscus height. There is also significant difference between diabetics and non-diabetics regarding normal and abnormal tear film breakup time. However, there are no significant differences between diabetic and control group in the presence or absence of tear film debris.

Conclusion: Tear film stability is decreased in diabetic patients. These results suggest that diabetic patients are more prone to suffering from dry eye symptoms than normal subjects.

Keyword: Tear, diabetic, dry eye.

Introduction

Diabetes mellitus (DM) is a major health problem in the industrialized world and a rapidly escalating problem for developing countries ^(1, 2), where urbanization is producing lifestyle changes that increase the risk factors for the disease.

It has been suggested that chronic hyperglycemia, corneal nerve damage and impairment on insulin action may lead to alteration in tear film and ocular surface⁽²⁻⁴⁾. In the last 20 years, there is a recognized increase in complaints of dry eye and ocular

discomfort by patients with diabetes mellitus ⁽⁴⁾. Recent studies showed that ocular discomfort and dry eye in diabetic patients are associated with lacrimal glands and tear film dysfunctions ^(5, 6).

Sever neuropathic changes in the cornea of diabetic patients mask symptoms of dry eye and punctate epitheliopathy which may lead to silent resistant corneal ulcer with late presentation. ^(1, 7, 8).

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Patient and Methods

An interview was carried out with patients using an informative questionnaire which include many items:

(Age, sex, occupation, smoking, and, ocular history, lid and conjunctival examination. Studying dryness feature, state of cornea and its sensation).

Patients with a fasting blood glucose level of less than 140 mg/dl were regarded as having good metabolic control. Individuals who had a history of drug abuse, laser treatment, contact lens wear, topical medication, ocular surgery within the previous 3 months, pregnancy, history of systemic diseases with ocular manifestations affecting tear secretion abnormalities in the cornea, conjunctiva, or eyelid, and secondary ocular and systemic disease were excluded from this study.

The corneal sensitivity test, tear film break-up time (BUT), marginal tear meniscus height, presence of tear debris was documented.

The tear film break-up-time(BUT) is an index of precorneal tear film stability. It is measured by instilling fluorescein in the eye after blinking of the patient, a slit lamp cobalt blue filter used to examine the tear film on the surface of the cornea. Dry areas on corneal surface seen as lines or black spots will appear after a short time. Tear film BUT is the time when first dry spot appears on the corneal surface. We ignored the appearance of dry spots on same location every time which is mainly due to local abnormalities of corneal surface rather than ocular surface disease. A(BUT) of less than 10 seconds is abnormal.

The marginal tear meniscus which is a crude measure of the volume of aqueous in the tear film was measured for each patient on the slit lamp. In the normal eye the meniscus is about 1 mm in height, while in dry eye it becomes thin or absent.

Tear film debris are abnormal filaments or material accumulation on the surface of the cornea that disturb regular and smoothly

precorneal tear film. Tear film debris may move with each blink and cause blurring of vision and foreign body sensation. Its presence or absence can be documented directly by slit lamp examination of the cornea.

SPSS version 16 for windows was used for statistical analysis. The student t - test were used for percentages and comparisons. A P-value of equal or < 0.05 was considered significant.

Results

Table (1) shows the frequency &percentage of ocular symptoms and its relation with presence or absence of DM. It shows that only 2 (2.8%) from the diabetic group has blurred vision were as no one (0. %) in control group has this symptom. About 20 (27.8%) diabetic patients complain from burning sensation as compared with 4 (4.5%) from the normal group. Foreign body sensation was found in 7 (9.7%) diabetic patients and not found in control group. Grittiness of the eye were found in about 5 (6.9%) in affected group and 5 (5.6%) in control group. Eye stickiness were found in 9 (12.5) diabetic cases and in 2 (2.2%) of normal control group. 29 (40.3%) diabetic patients and 78 (87.6%) persons of control group have no ocular symptoms. P- value was <0.001 .

Tear meniscus were found abnormal in 34 (47.2%) diabetic patients as compared with 11 (28.0%) persons from normal control group. Normal tear meniscus found in 38 (52.8%) diabetic patients and in 78 (87.6%) persons from the control group. P- value was <0.001 . Abnormal tear film BUT were found in 44 (61.1%) diabetic patients and in 11 (12.4%) persons from the control group. P- value was <0.001 .

Tear film debris were present only 3 (4.2%) diabetic patients and not present in about 69 (95.8%) of them. There is no tear film debris in control group (0%). P- value was 0.052.

Table 1. Ocular symptoms among diabetic patients and normal.

	Symptom						Total
	Blurred vision	Burning	Foreign body sensation	Grittiness	Non	Stickiness	
Cases	2	20	7	5	29	9	72
	2.8%	27.8%	9.7%	6.9%	40.3%	12.5%	100.0%
Control group	0	4	0	5	78	2	89
	.0%	4.5%	.0%	5.6%	87.6%	2.2%	100.0%
Total	2	24	7	10	107	11	161
	1.2%	14.9%	4.3%	6.2%	66.5%	6.8%	100.0%
P value	<0.001						

Table 2. Tear meniscus in the groups of control and diabetics.

		Tear meniscus		Total	
		Abnormal	Normal		
Group	Cases	34	38	72	
		47.2%	52.8%	100.0%	
	Control	11	78	89	
		12.4%	87.6%	100.0%	
Total		45	116	161	
		28.0%	72.0%	100.0%	
P value		<0.001			

Table 3. Tear film BUT in the groups of control and diabetics.

		BUT		Total	
		Abnormal	Normal		
Group	Cases	44	28	72	
		61.1%	38.9%	100.0%	
	Control	11	78	89	
		12.4%	87.6%	100.0%	
Total		55	106	161	
		34.2%	65.8%	100.0%	
P value		<0.001			

Table 4. presence or absence of tear film debris in the groups of control and diabetics.

		Group		Total	
		Cases	Control		
Tear film debris	Non	69	89	158	
		95.8%	56.3%	100.0%	
	Present	3	0	3	
		4.2%	.0%	100.0%	
Total		72	89	161	
		44.7%	55.3%	100.0%	
P value		0.052			

Discussion

Diabetes is an increasing problem in Iraq and it is of great interest to the ophthalmologist because of its several challenging ocular manifestations. The suggested mechanism that explain the relationship between diabetes and dry eye (3).

Chronic hyperglycemia damage corneal nerves resulting in corneal anesthesia (6). The loss of corneal sensation leads to decrease tear secretion from the lacrimal

gland due to decrease of reflex stimulation in dryness (1, 9).

The growth of corneal epithelial cells and the metabolism of lacrimal gland affected by the level of insulin in the body. Biomechanical changes of cornea and lacrimal gland leading to dry eye can result from low insulin level (1, 4, 10).

Hyperglycemia can trigger release of inflammatory factors such as cytokines. The resulted lacrimal gland inflammation may lead to aqueous deficiency and secondary dry eye (11).

Table (1) shows that most of the patients have no symptoms (40.3%) followed by burning (27.8%) and followed by Stickiness (12.5%), foreign body sensation (9. 7%). Grittiness, and the least symptom was blurred vision (2.8%) in contrast to control group most have no symptoms (87.6%) followed by Grittiness (5.6%), burning (4.5%), Stickiness (2.2%). And there is highly significant difference between cases and controls regarding symptoms ($p<0.001$).

Table (2) shows that there is significant difference ($p<0.001$) between diabetics and non-diabetics in presence of normal (72.0%) or abnormal tear meniscus height (28.0%).

There is significant difference ($p<0.001$). Between diabetics and non-diabetics regarding normal (65.8%) and abnormal BUT (34.2%) as shown in table (3).

Abnormalities of tear film in diabetes have been documented in many studies, but controversy in the results still present. In some studies, total and reflex secretion of tears were reduced significantly, but there is no changes in tear film BUT and basal tear secretion⁽¹²⁾.

However, a decrease in tear film BUT and basal secretion were reported in other studies

Dogru et al reported that in poorly controlled diabetic patients with peripheral neuropathy, there is a decrease in both tear film BUT and basal tear secretions, he found that there is no relation with the stage of diabetic retinopathy or duration of diabetes. These observations suggest that lacrimal gland innervation is affected by diabetic neuropathy⁽¹³⁾. Saito et al reported no correlation between diabetic retinopathy stage with total or reflex tear secretion⁽¹²⁾. There is no significant difference between diabetic and control group regarding the presence or absence of tear film debris as shown in Table (4).

Conclusion

It is concluded that tear film stability is decreased in diabetic patients. These results suggest that diabetic patients are more prone to suffering from dry eye symptoms than normal subjects. It is recommended to carefully look for features of dry eye or tear film instability in diabetic regardless the presence or absence of signs and or symptoms specially in candidate for corneal or photorefractive surgery.

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