

Impact of Duration of Diabetes on Schirmer's Test and Tear Film Break up Time

Dr. Rashmi S¹, Dr. Pooja Adappa, Dr. Vidya Hegde, Dr. Rashmi Jain,
Dr. Anupama B.²

¹(Ophthalmology, Yenepoya Medical College, India)

²(Ophthalmology, Yenepoya Medical College, India)

Abstract : Dry eye is very commonly seen in diabetic patients and it needs to be detected and treated early. The purpose of this study is to measure tear film parameters in diabetic patients using tests like Schirmer's test and Tear film Break Up Time (T-BUT) and to correlate them with duration of diabetes mellitus. This is a cross sectional study which included 200 eyes of 100 adult patients with type 2 diabetes mellitus. The duration of diabetes was noted. All patients underwent measurement of T-BUT in both eyes. After 30 minutes, Schirmer's test was performed with anesthesia with eyes closed. The values of Schirmer's test and T-BUT test were correlated with duration of diabetes using Pearson's coefficient of correlation. There is strong negative correlation between duration of diabetes and T-BUT value. There is moderate negative correlation between duration and Schirmer's value which is found to be statistically significant ($p < 0.001$). Diabetes adversely affects the tear film parameters. As duration of diabetes increases, there is fall in both Schirmer's value and T-BUT value. T-BUT is more strongly affected.

Keywords: Diabetis mellitus, Ocular surface disease, Schimers test , Tear film break up time

I. Introduction

Diabetes is one of the most common leading causes of ocular morbidity. It is associated with cataract, retinopathy and ocular surface disease. Diabetes is a known risk factor for dry eye syndrome. The prevalence of dry eye syndrome in diabetes has been reported to be upto 54.3%.^[1] Dry eye syndrome (DES) is a multifactorial disease, affecting tears and the ocular surface. It is accompanied by increased osmolarity of tear film, and inflammation of the ocular surface.^[2,3,4] A low insulin level in diabetes disrupts the biochemical balance of corneal and lacrimal gland metabolism as well as epithelial cell proliferation, resulting in ocular dryness. Hyperglycaemia causes inflammatory alteration leading to impaired tear secretion. Inflammation is not only a cause, but also a consequence of dry eye. Aqueous deficient dry eye or lacrimal insufficiency usually results from lacrimal gland inflammation. Hyperglycaemia and micro vascular damage to the corneal nerves can disrupt the innervations of the ocular surface which in turn leads to inadequate tear secretion.^[5] However, corneal hypoesthesia reduces patient's symptoms, hence patient may be asymptomatic at the beginning stage of the disease.^[6] DES reduces the working efficiency of an individual because it induces ocular discomfort and visual disturbance. DES in diabetics may compromise quality of life when it leads to complications such as punctate keratopathy, recurrent erosion, persistent epithelial defects, neurotrophic keratopathy, wound healing delay, higher risk of microbial keratitis, and potential visual impairment due to corneal scarring. Therefore it is should be diagnosed and treated early. Commonly used diagnostic tests in dry eye to measure tear film parameters include Schirmers test and TBUT (tear film break up time) tests. Schirmers test measures tear production and TBUT is a measure of ocular surface integrity. Diabetes adversely affects tear film parameters. The current study assesses how tear film parameters change over years in diabetes patients. Aim of this study is to correlate the tear film parameters and duration of diabetes.

II. Materials And Methods Heading

This is a cross sectional study which included 200 eyes of 100 adult diabetic patients with type 2 DM who attended ophthalmology outpatient department. Contact lens users, post Lasik patients, smokers, patients on antihistamines, antidepressants, oral contraceptives, patients with Sjogrens syndrome, rheumatoid arthritis and patients with any pre existing ocular disease were excluded from the study. All patients were asked about duration of diabetes and it was recorded. All patients underwent Schirmer's test and T-BUT test in both eyes with same make of Schirmer's strip and florescence strip. Schirmer's test assesses tear production and T-BUT assesses ocular surface integrity. T-BUT was first performed first as manipulation of the eyelids could affect the results. T-BUT was estimated with fluorescence strip and slit lamp bio microscope under cobalt blue filter. Two successive readings were taken and averaged. Patient then waited for 30min, and then Schirmer's test with anaesthesia was performed with eyes closed. Tests were performed under relatively unvarying environmental

condition for all the subjects to eliminate the variation of temperature. The tests were done in a semi dark room with no obvious ventilatory current. Between TBUT test and Schirmer's test a reasonable time gap was maintained so that no mutual interference occurred. The values of above tests were noted. The values of Schirmer's test and T-BUT test were correlated with duration of Diabetes using Pearson's coefficient of correlation.

III. Results

This study assessed the duration of diabetes with the values of Schirmer's and T-BUT in 200 eyes of 100 diabetic patients. The mean age of study population was 55.8 ± 8.60 yrs. The population with longer duration of diabetes had lower Schirmer's value. There was a moderate negative correlation ($r = -0.513$) between duration of diabetics and Schirmer's value which was found to be statistically significant ($p < 0.001$). T-BUT was also reduced in patient who were diabetic for longer duration and hence statistically there was strong negative correlation ($R = -0.704$) between duration of diabetes and T-BUT value. There is strong negative correlation between duration of diabetes and T-BUT value. There is moderate negative correlation between duration and Schirmer's value which is found to be statistically significant ($p < 0.001$).

		Coefficient of correlation	P value(<0.001)
Correlation of duration of Diabetes with Schirmers test	RE	-0.513	0.0001
	LE	-0.517	0.0001
Correlation of duration of Diabetes with TBUT	RE	-0.704	0.0001
	LE	-0.384	0.0001

IV. Discussion

Diabetes mellitus and its clinical association with dry eye and ocular surface are becoming a frequent problem in ophthalmology. Some metabolic, neuropathic and vascular tissue damages occur in diabetes leading to an inflammatory process and functional degeneration. The pathological mechanism include hyperglycemia, advanced glycated end product accumulation, oxidative stress and inflammatory pathways.^[7] Many studies show association between diabetes and dry eye status.^[1,5,8,9] In a study by Yoon KC et al, it was observed that in diabetic patients, the degree of keratoepitheliopathy was severe, and the corneal sensitivity, T BUT, and tear secretion were significantly reduced.^[9] Conjunctival impression cytology showed a higher grade of conjunctival squamous metaplasia and lower goblet cell density in the diabetic patients. All parameters were related to the status of metabolic control, diabetic neuropathy, and stage of diabetic retinopathy. They suggest that diabetic patients with poor metabolic control, neuropathy, and advanced stage of retinopathy should be examined for tear film and ocular surface changes.^[9] All the tear film parameters are adversely affected in diabetic patients. A study comparing diagnostic values of three tests (Schirmer's, TBUT and rose bengal test) in patients with type 2 DM revealed that among these tests, Schirmer's test and rose bengal test have more diagnostic value in diabetics as compared to TBUT. They also suggest that ocular surface disease could be confirmed by performing multiple tear film tests.^[8] In our study we have performed only Schirmer's and TBUT. We found that as duration of diabetes increases, there is worsening of these parameters. Similar results have been seen by few previous studies which reveal that duration of diabetes has adverse impact on dry eye disease^[10,11] It has been noted that prevalence of dry eye is significantly high in patients with long duration of diabetes. Some studies has been conducted where in the blood glucose concentration, HbA1c were correlated with various tear film parameters. A study concluded that long term glycemic control can modify the qualitative and quantitative properties of tear film. Thus HbA1c level can be considered as one of the important predictor of dry eye syndrome among diabetic patients.^[12] One of the limitations of our study is that we did not record the glycemic control of the patients. When a patient suffers from diabetes for long duration, some changes are inevitable. However with good glycemic control most complications can be prevented. In all diabetic patients, we need to rule out dry eye status whether the patient is symptomatic or not. Some diabetic patients may be asymptomatic during early stages of dry eye due reduced corneal sensitivity. Hence there is a need to specifically look for objective signs of dry eye.

V. Conclusion

Diabetes adversely affects the tear film parameters. As duration of diabetes increases, there is fall in both Schirmer's value and T-BUT value

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