A study on analogy and similitude in relation to tear stability and tear flow by using Schirmer's tear test and Fluorescein dye in patient attending south Indian tertiary care hospital

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Abstract

Introduction: A stable tear film (precorneal film) with normal flow is essential for preserving a clear cornea. It gets affected in day to day life and results in dry eye syndrome due to irritation, stress, dust, fumes, toxins and other factors causing visual disturbances. Tear stability and tear flow study will give an estimate of the eye condition in order to take necessary measure to maintain eye in a healthy condition.

Aim and Objectives: To determine the tear film stability and tear flow in patient attending ophthalmology outpatient department and to assess relationship between tear flow and tear film stability.

Materials and Method: 30 patients aged between 18 to 25 years complaining of various eye related problems were enrolled in our studies followed by tear film examination and tear flow test by using Schirmer test and Tear break up time respectively to find out tear film stability and tear flow.

Statistics: Observations were mean±SD and Pearsons co-relation co-efficient was perform to analyse the data. $p < 0.05$ was considered statistically significant.

Results: The mean value of tear break up time in right eye was 9.894 ± 1.178 ($p > 0.05$) and of the left eye was 9.798 ± 0.936 ($p > 0.05$). The mean value of schirmer test in right eye was 22.43 ± 5.752 ($p > 0.05$) and of the left eye was 22.93 ± 4.448 ($p > 0.05$). The correlation between the schirmer test and Tear break up time in right eye with Pearsons correlation coefficient was calculated to be -0.298 ($p > 0.05$) and of the left eye was 0.126 ($p > 0.05$).

Conclusion: This study concludes that there was no relation between Tear break up time and Schirmer test and are independent of each other.

Keywords: Fluorescein dye, Schirmer's tear test, Tear break up time, Tear stability.

Introduction

A stable tear film with normal flow is essential for preserving a clear cornea. Tear film is the fluid covering the cornea called as precorneal film. Tear is a liquid produced by the body to lubricate the eyes and maintaining the clarity of cornea. It has the functions like, keeps the cornea and conjunctiva moist, provides oxygen to the corneal epithelium, washes away debris and noxious irritants, prevents infection due to presence of antibacterial substances, facilitates movements of the lids over the globe and many more. In today's scenario, due to various factors like increasing lifespan of people, environmental pollution, excessive use of TV, computers and air conditioning systems increases the incidence of abnormalities of tear physiology.[1]

Tear film consists of 3 layers (posterior to anterior) mucus layer, aqueous layer and lipid or oily layer. Each layer is derived from different glands. Mucus layer is derived from conjunctiva goblet cells, middle aqueous layer from main lacrimal gland and outer lipid layer from marginal glands like Meibomian glands, gland of Zeis and Moll. Hence, blockage or any defect of these glands results decrease production of substances.[2]

Tear flow is determined by using Schirmer test. The tear film stability can be determined by using Tear break up time using Fluorescein dye, which is a pharmacological agent. Tear breakup time is defined as the time taken for the appearance of first dark spot on the corneal surface. The determination of tear film stability by break-up- time (BUT) has been proposed as a diagnostic aid in certain dry eye syndrome.[3]

There has been debate that a correlation exists between tear stability and tear flow in condition of dry eye syndrome, hence to evaluate this, the following study has been in patients attending south Indian tertiary care hospital complaining symptoms related to dry eye syndrome.

Material and method

This study was approved by institutional ethics committee A.J. Institute of medical science & research centre (AJIMS& RC), Ref. No. AJEC/REV/37/2016 dated 12/02/2016. This study was conducted among 30 subjects (male & female equal number) aged 18-25 from attending ophthalmology outpatient department of AJIMS & RC. All the subject in this study had undergone general examination, followed by Schirmer test and Tear break up time to find out tear flow and tear film stability.

Inclusion criteria: Subjects aged between 18 to 25years.Students of A.J institute of medical Sciences, Mangalore.

Exclusion criteria
1. Subjects with history of any systemic diseases.
2. Age group below 18 and above 25.

Schirmer's test

Schirmer's test was carried out to calibrate amount of tear secretion using Whatmann-41 filter paper. Wetting scale of less than 10mm in 5 minutes was considered abnormal. Schirmer's tear test filter paper strips will be inserted in the lateral part of the lower fornix without using any surface anaesthesia. The patient will be instructed to keep his eyes open and look up. At the end of 5 minutes the strips will be removed and the dampness measured on a millimetre scale.

Tear break up time

Tear break up time was evaluated by using pharmacological fluorescein (dye) strips. The inferior tarsal conjunctiva touched lightly with this strip. The subject was asked to blink several times to distribute the Fluorescein dye in the tear film. Then, they have

asked to stare without blinking while the cornea was observed through bio microscope using specular reflection illumination technique with cobalt blue filter. The time between a complete blink and appearance of a random dark spot in the fluorescein film was measured in seconds. No anaesthetics were used as it can hasten the tear breakup.

Statistics

Pearsons co-relation co-efficient was perform to analyze the data.

$$r = \frac{cov\,(xy)}{\sigma_x \sigma_y}$$

$$= \frac{\Sigma\,(x_i - \bar{x})\,(\bar{y_i} - y)}{\sqrt{\Sigma\,(x_i - x)^2} \quad \sqrt{\Sigma\,(y_i - y)^2}}$$

1. Where r is the Pearsons correlation coefficient.
2. x and y are the means of two samples.
3. σ_x and σ_y are the standard deviations.

Results

Table 1: Tear Breakup Time (T BUT) in Right eye and Left eye

	Range	Minimum	Maximum	Mean ±SD
T BUT (RE)	4.60	7.67	12.27	9.89±1.17*
T BUT (LE)	3.51	7.71	11.22	9.79±0.93*
Observations were mean ± SD and Pearsons co-relation co-efficient was perform to analyse the data. *p> 0.05 Not significant. T BUT- Tear Breakup Time, RE-Right Eye, LE-Left Eye				

Table 2: Schirmer test in Right eye and Left eye

	Range	Minimum	Maximum	Mean ±SD
Schirmer (RE)	20	13	33	22.43±5.72*
Schirmer (LE)	3.51	7.71	11.22	22.93±4.44*
Observations were mean ± SD and Pearsons co-relation co-efficient was perform to analyse the data. *p> 0.05 Not significant. RE-Right Eye, LE-Left Eye				

Table 3: Pearson correlation between Schirmer and Tear Break up time (T BUT) in Right eye

	T BUT RE
Schirmer (RE)	-0.298
RE-Right Eye	

Table 4: Pearson correlation between Schirmer and Tear Break up time (T BUT) in Right eye

	T BUT LE
Schirmer (RE)	0.126
LE-Left Eye	

Discussion

Dry eye is a multifatorial disease of the tears and ocular surface that results in symptoms of discomfort, visual disturbance, and tear film instability with potential damage to the ocular surface according to the International Dry Eye Workshop and many authors opine that dry eye is one of the most frequent

conditions in ophthalmologic practice, affecting between 15 and 40% of general population.

Dry eye usually provokes variable symptoms from light ocular discomfort to incapacity in keeping the eyes open. Dry eye syndrome (DES) is considered in the differential diagnosis of each and every patient presenting any of those symptoms. The diagnosis of

Dry eye is based on the clinical features and some diagnostic tests. Schirmer test (ST) is one of the most used diagnostic tools in evaluating ocular surface status. The other tests used are red phenol thread, break-up-time, rose bengal, fluorescein, lissamine green, impression cytology, biochemist analysis of the tear, interferometry, meniscometry and osmolarity measurement.[4-13]

One of the previous study involving Schirmer and tear film break-up time found positive correlation between T BUT and Schirmer's test, but our study showed no relation between the T BUT and Schirmer test (Table 1 & 2). The correlation between Schirmer test and Tear breakup time was found out by using Pearsons correlation coefficient and was a negative correlation between the schirmer and tear break up time in right eye and in left eye (Table 3 & 4). In summary, the result of this study indicates that, Schirmer's test and Tear break-up-time are independent of each other. There was no relation between both the tests.

Limitation of the study
1. This study has no evidence to show the values of Tear break up time and Schirmer test in patients suffering from systemic and ocular diseases.
2. Limited Sample size
3. This study was limited to the students of A.J. Institute of Medical Science in Mangalore, Dakshina Kannada District, South India and also to the age group of 18- 25.

Conclusion
Our study concludes that there was no relation between Tear break up time (T BUT) and Schirmer test and are independent of each other. However further studies are needed with larger sample size to conclude our findings.

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