Short Communication

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Tear Film Break-Up Time: Comparison between Patients using Psychiatric Drugs and Healthy Individuals

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Abstract

***Background*:** Ocular dryness is a well-recognized adverse side effect of many medications. The purpose of this study was to compare tear film stability between psychiatric patients that use lithium carbonate or carbamazepine and normal cases.
***Materials and Methods*:** Tear film break up time test was performed in three groups, 30 patients using lithium carbonate, 30 patients using carbamazepine and 30 normal cases. Values of the TBUTs were compared among groups by the independent *t*-test.
***Results*:** Differences between both of patients and control groups were significant (p<0.0001).
***Conclusion*:** The results show that these drugs contribute to decrease of tear film break up time.

Introduction

The surface of the eye is protected by tears. Tears are made up of 3 layers: a water layer, a fatty or oily layer, and a mucous layer. When there are not enough tears being produced by the eye, or if the tears are lacking in one or more of these layers, the eye can feel dry. Dry eye is common and can be related to eye problems or disease affecting the whole body. Dry eye is a frequent adverse effect of medications [1]. All psychotropic medications have the potential to induce numerous and diverse unwanted ocular effects. The disorders of eyelid and of the keratoconjunctivitis are mainly related to phenothiazines and lithium [2]. Dry eye syndrome is a very common eye condition that affects quality of life as an important and common public health problem [3]. Dry eye can be caused by different mechanisms [4]. Many systemic drugs have been associated with ocular and visual side effects that require patient management [5]. Some of drugs that used in psychiatry are known to cause ocular drying. Studies showed that these drugs also contribute to decrease of tear film production [6, 7]. Lithium carbonate and carbamazepine are two of the most popular drugs used in psychiatric patients for the treatment of bipolar disorders. Bipolar disorder, e.g., manic depression is a chronic disease that warrants long-term treatment strategies [8]. The purpose of this study was to compare tear film stability between patients that use lithium carbonate or carbamazepine and normal cases.

Materials and Methods

In this cohort study, with convenient samples, tear film stability was evaluated in 90 eyes of 90 subjects divided into three groups by optometrist under standard environmental conditions (45% humidity, 27°C temperature) in Tehran city. These groups were 30 patients using only lithium carbonate (900 mg/day: group 1), 30 patients using only carbamazepine (600 mg/day: group 2), for more than 2 years with no history of systemic disease. Tear film break-up time (TBUT) is a method for determining the stability of the tear film and checking for evaporative dry eye. In testing for TBUT, sodium fluorescein filter paper is added to the eye and the tear film is observed under the slit lamp (HAAG-STREIT Model) while the patient avoids blinking until tiny dry spots develop.

Generally, higher than 10 seconds are thought to be normal [9-11]. Five to 10 seconds, marginal, and lower than 5 seconds low. A short tear break-up time is a sign of a poor tear film and the longer it takes, the more stable the tear film. The third group comprised 30 age and gender matched controls without topical and systemic medications. Written informed consent was obtained from all participants. For evaluation of tear film stability, TBUT test was performed and the time required for dry spots to appear on the corneal surface after blinking was measured. Test was repeated three times for each eye. Mean values of TBUTs were compared among 3 groups by the independent *t*-test. Analysis was performed with statistical package SPSS-16 software (p<0.0001).

Results

Descriptive statistics for the variables examined in this study including age, sex and TBUT are presented in table 1.

Table 1. The mean TBUT in the bipolar and normal groups

Test groups	Gender		Age (yr)	TBUT* (seconds)
	Men (%)	Female (%)	Mean±SD	Mean±SD
Group 1 (Lithium)	14 (46.6)	16 (53.3)	31.56±10.29	5.86±0.78
Group 2 (Carbamazepine)	12 (40)	18 (60)	30.36 ±9.32	6.58±1.67
Group 3 (Control)	15 (50)	15 (50)	33.82±12.45	22.69±10.74

*TBUT: Tear-film Break up time

The mean TBUT in the test groups were 5.86±0.78 seconds (group 1), 6.58±1.67 seconds (group 2) and 22.69±10.74 seconds (group 3), respectively. There were no statistically significant differences between groups 1 and 2 in TBUT values. But differences between both of this groups and group 3 (normal group) were significant (p<0.0001).

Discussion

Our study revealed that long term therapy with lithium carbonate and carbamazepine reduced the results of the tear film break up test. The TBUT results of both groups (lithium-treated and carbamazepine-treated patients) not significantly different. In normal group the TBUT average was 22.69±10.74 seconds. This value is similar to that reported by several previous studies, but lower than that reported by some others [12, 13]. Dry eye syndrome is a clinical condition characterized by deficient tear production or excessive tear evaporation. Drugs may lead to irritation or inflammation of the cornea (the eye's surface) and cause vision problems and dry eye [1]. The TBUT test is the most commonly used in the diagnosis of dry eye [14].

The TBUT test reflects tear stability and composition. An unstable tear film can explain dry eye symptoms in patients who have normal quantity of tears. Unstable means that the composition of the tears is imbalanced, resulting from tears evaporating too quickly or not adhering properly to the surface of the eye. Although long-term treatment with lithium/ carbamazepine is an effective way to reduce the frequency, severity and duration of manic and depressive episodes in patients with bipolar disorder, studies show that these drugs have been associated with many systemic and ocular side effects [12]. The effect of lithium and carbamazepine on the ocular surface has been previously reviewed [7, 14]. But, during our Medline review we could not find any previous studies evaluating the effects of lithium carbonate and carbamazepine on tear film function. Only one document by Ben-Aryeh et al., lowered tear secretion was reported in 22 manic-depressive patients on lithium therapy [5].

We found in other study, that lithium carbonate and sodium valproate contribute to decrease of tear film break up time, resulting from dryness of the eyes [15]. According to researches the TBUT value may vary in different populations. The differences in findings may also be partly due to different methods of investigation, or differences based on geography and climate, and may be due to the age range of subjects in this study [12, 13]. Our study has several limitations. First, the sample size was fairly small and the results obtained should be replicated in larger samples. Another potential limitation relates to our assessment of tear film using only TBUT test. The best quantitative way to evaluate the precorneal tear film is the TBUT test, concurrent with Shirmer test. Finally, it must be noted that dry eye is one of ocular side effects of drugs. Dry eye may lead to irritation or inflammation of the cornea (the eye's surface) and cause vision problems many ocular effects of medications that used in psychiatry can only be identified with a complete examination and, since eye is an organ system frequently ignored by therapists, these effects are infrequently considered. In turn patients in our study were under monotherapy, it seems likely that incidence of ocular side effects increases sharply with the use of polypharmacy that is very common in psychiatry.

Psychiatrists, eye care professionals and patients need to be aware of any associated medication-induced adverse effect such as dry eye. Clinicians should try to use the lowest dose possible to achieve the desired therapeutic effect. Early prevention and intervention can avoid of ocular adverse effects. Eyedrops, called artificial tears, can be used to help make the eye feel moister. Lifestyle changes, especially avoiding cigarette smoke and air pollution and other things that irritate the eyes, can be helpful. Humidifying the air at home or at work may ease dry eye symptoms. For some individuals, a procedure to block tear drainage may increase the amount of tears that stay in the eye.

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Authors' Contributions
All authors had equal role in design, work, statistical analysis and manuscript writing.

Conflict of Interest
The authors declare no conflict of interest.

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