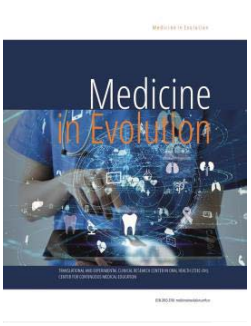
Treatment effectiveness of dry eye syndrome among computer users



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Abstract

The aim of the study is to evaluate the symptoms of dry eye syndrome among computer users and to evaluate the effectiveness of treatment with various topical medication (artificial tears). The investigative methods used were: Ocular surface disease index questionnaire (OSDI), based on 12 questions related to subjective ocular signs and symptoms that occurred during various activities of daily living, the Schirmer I test (without anesthesia), tear break-up time (T-BUT) and tear pH. In this study were admitted 35 subjects, video terminal operators (VDT), 12 Male (M) and 23 Female (F), average age of 38.51 years, with signs and symptoms of dry eyes, no acute ocular pathology, no previous eye surgery and no topical drugs administered two months before the study. The results show an improvement in symptoms after one month of treatment with topical medication.

Keywords: computer users, risk factor, dry eye syndrome

INTRODUCTION

Dry eye disease it's one of the most common ocular comorbidities and may overlap with other causes of ocular surface disease, such as ocular allergy and meibomian gland dysfunction. Dry eye syndrome is a multifactorial disease whose outcome is malfunctioning of the tear film due to insufficient tear production qualitative or quantitative or increased tear film evaporation, with potential damage to the ocular surface [1]. A study made by the National Institute of Safety and Health at Work shows that about 90% of those computer workers are affected by dry eye syndrome [2]. Computer vision syndrome, also referred to as digital eye fatigue, has been described by the American Optometry Association as a vision and eye problem seen in long-term computer, tablet, and cell phone users [3]. The use of computers leads to decreased blink rate, incomplete blinking, faster evaporation of tears from the eye surface and later to dry eye syndrome [4].

Aim and objectives

The aim of this study was to evaluate the influence of computer workers on the symptoms of dry eye and to evaluate the effectiveness of treatment on the ocular surface using various topical drugs (artificial tears).

MATERIAL AND METHODS

In this study were admitted 35 subjects who work on the computer between 5 and 10 hours a day, 12 M and 23 F, mean age of 38.51 with signs and symptoms of dry eyes, no acute ocular pathology, no previous eye surgery and without topical medication given two months before inclusion in the study. All patients admitted to the study were evaluated on the day of enrolment in the study and after 30 days of treatment through the OSDI questionnaire. Schirmer I test, T-BUT and tear pH were performed in the morning (before work), in the evening (after work), on the same day and after 30 days of treatment (in the evening - after work). Also, the measured values were noted for each eye (RE – right eye; LE – left eye). All subjects were treated with a tear substitute - 1 drop 3 times/in both eyes/day for 30 days.

Ocular surface disease index questionnaire (OSDI) is based on 12 questions related to subjective ocular signs and symptoms that occurred during various activities of daily living. The overall OSDI score defined the ocular surface as normal (0-12 points) or as having mild (13-22 points), moderate (23-32 points), or severe (33-100 points) disease [5].

For the Schirmer I test we used the standard test paper strip, inserted in the conjunctival sac, without anesthesia. After 5 minutes it was removed and the wet length of the strips was read, the results being noted in millimeters. The normal values of Schirmer I test are over 15 mm/5 min.

Tear break-up time (T-BUT) - a drop of fluorescein 0,5% it's applied in the lower conjunctival fornix. The patient is asked to blink several times and the interval between the last blink and the appearance of the first black spots on the corneal surface is measured in seconds. Tear film break-up time is a standard and widely accepted test for tear film stability assessment [6]. Results over 10 seconds are considered normal values.

For the tear pH, we used pH strips of paper inserted into the conjunctival sac and left to soak with tears, then the color obtained was compared with the color of the test scale. Normal values are considered between 6.5 – 7.6.

RESULTS

In this study were admitted 35 subjects, video-terminal operators, 12 men and 23 female, with a mean age of 38.51 years [Table 1]. The average working hours on the computer

was 7.6 hours / day. In all subjects included in this study, after 30 days of treatment with artificial tears was observed a decrease or disappearance of symptoms present at baseline.

Table 1. Distribution of patients by age / gender / smokers/ non-smokers

Age category	M smokers	F Smokers	M non-smokers	F non-smokers	Total / Category
20-29	0	0	2	4	6
30-39	0	2	4	3	9
40-49	0	3	6	9	18
50-59	0	0	0	2	2
Total	0	5	12	18	35

All patients responded to OSDI questionnaires before treatment and after 30 days of treatment. The average OSDI initial score was 43.83, and after 30 days of treatment the average OSDI score was 27.45. The results show an improvement in the post-treatment OSDI score, which indicates an improvement in dry eye symptoms, as well as less discomfort in daily activities [Figure 1].

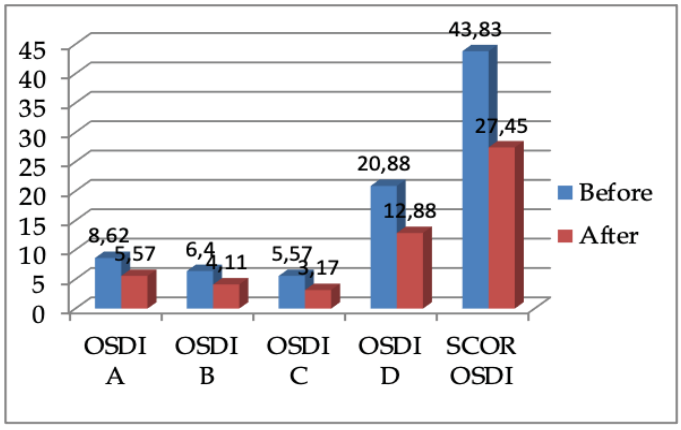

Figure 1. OSDI questionnaire answers before and after 30 days of treatment

The results of the Schirmer I test show a decrease in tear secretion in the evening compared to those measured in the morning, as well as an increase in tear secretion after treatment. The results of the Schirmer I test after treatment show us post-treatment values, measured in the evening, are comparable and slightly above the value of the Schirmer I test performed in the morning, without treatment [Figure 2]. The difference between the two eyes has no statistical significance.

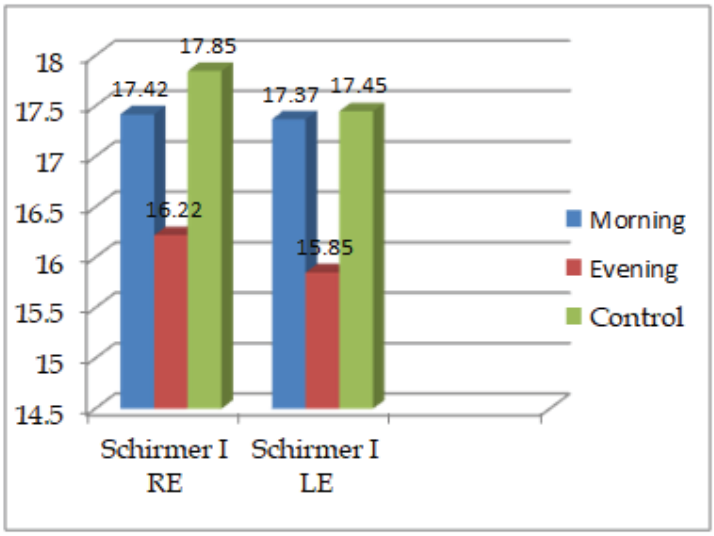

Figure 2. Schirmer I test results in the morning, evening and post-treatment control

A large statistical difference can be observed in the measurements of the tear break-up time performed in the morning, evening and after 30 days of treatment, which makes us think of an excessive evaporation of the tear film in computer users [Figure 3]. The difference between the two eyes has no statistical significance. After one month of treatment, the tear film rupture values were higher than the values measured in the morning without treatment.

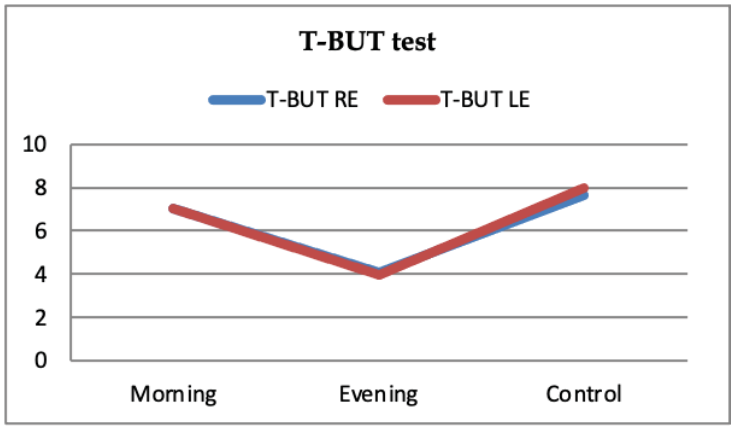

Figure 3. T-BUT test results in the morning, in the evening and at post-treatment control

The diagram below [Figure 4] shows an increase in pH in the measurements performed in the evening (RE – 7.48; LE – 7.710), without treatment, as well as a decrease in tear pH to normal values at 30 days of treatment (RE – 7.17; LE – 7). This shows that lacrimal Ph tends to alkalize in people with dry eye syndrome.

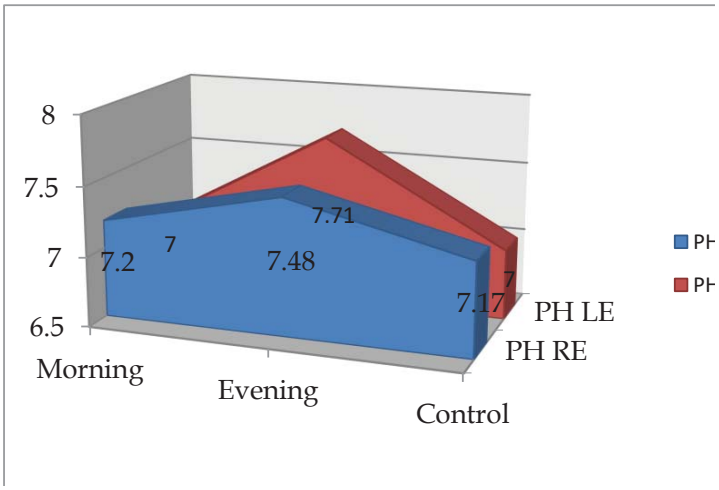

Figure 4. Tear PH values in the morning, evening and post-treatment control

DISCUSSIONS

It was shown in this study that a long-term use of the computer for more than 5 hours a day, causes instability of the tear film, which leads to increased evaporation of the tear film on the ocular surface. T-BUT, which shows the stability of the tear film, proved to be significantly lower in the initial measurements made in the evening, compared to the measurements in the morning. In addition, measurements made in the evening after 30 days of treatment, T-BUT values increased significantly compared to the initial measurements made in the evening. This shows a high instability of the tear film after a day of work on the computer, as well as an increased evaporation of tears from the eye surface. The increase in values after treatment shows that the use of artificial tears as an initial treatment for dry eye syndrome has a positive influence on the stability of the tear film. Portello et al. found a positive correlation between the number of incomplete blinks and eye dryness symptoms of individuals. They found a negative correlation between the number of blinks and relevant symptoms [7].

Lower values of the post-treatment OSDI score was found compared to the initial OSDI score, which correlates with the results of the other measurements performed in the study. Due to this, we can take the OSDI questionnaire as an adjuvant method to support the diagnosis of dry eye, as well as to reveal the symptoms of dry eye. F. Ozcura et. al. demonstrates that OSDI questionnaire is a standardized instrument to evaluate symptoms and can easily be performed and used to support the diagnosis of dry eye syndrome [8].

In this study, the results of the Schirmer I test show a decrease in measured values in the evening compared to the morning, as well as an improvement in the Schirmer I test after 30 days of treatment. The difference between the two eyes has no statistical significance.

Some clinical studies have demonstrated that the Schirmer test does not reliably detect the efficacy of drugs in patients undergoing treatment for dry eye. This variation has led to the changing methodology of the test and investigations into the cause of the test's variability [9].

In this study, the tear pH values have a tendency to alkalize at the initial measurements performed in the evening, compared to the morning values.

After 30 days of treatment, the Ph values have an average similar to the initial values measured in the morning.

Khurana et al. reported a small alkaline shift of 0.1 pH units in participants with dry eye compared to non-dry eye ones [10].

The increasing use of computers, laptops, tablets, smartphones has led to an increase in the prevalence of dry eye disease in the younger population, so additional epidemiological

studies are needed to accurately estimate the prevalence, the relationship between hours spent on computer screens and its preventive measures and awareness [11].

Tsubota K. had shown that the mean blink rate significantly drops down as level of concentration or attention increases. Mean blink rate is 22 per min in relaxed state to 10 per min when reading a book and 7 per min on the computers [12].

Sheedy JE demonstrate that the use of computer monitor in an ergonomic position - one arm distance or 40 inches away with a downward gaze of 14 degree or more appears to help relieve the symptoms of computer related dry eye. This is achieved by placing the monitor so that the top line of screen is at or below eyelevel [13].

Taking a short break, stretching the muscles, change of scenery and a quick walk around the office have been shown to improve productivity and reduce ocular symptoms of stress. Working nonstop for more than 4 hours has been associated with eye strain. Frequent short break can restore and relax the accommodative system of the eyes and preventing ocular strain and visual fatigue [14].

CONCLUSIONS

Dry eye syndrome is a multifactorial condition that occurs very frequently among computer users. The OSDI questionnaire, the Schirmer I test, the tear film rupture test, as well as the tear pH alone cannot support the diagnosis of dry eye, but together we can have a safe diagnosis, but also a starting point for evaluating the treatment of this syndrome.

Artificial tears as an initial treatment for dry eye syndrome can bring significant subjective improvements to the patients, but also objective improvements pursued through the investigations outlined above. Observing the values of the tear film rupture time, we conclude that the major component of dry eye syndrome in computer users is the evaporative one.

In order to bring additional benefits to dry eye symptoms in computer user, it is very important to place greater emphasis on prevention rules.

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