

# Is dry eye syndrome a work-related disease among radiologists?

Hüseyin Özkurt, Yelda Buyru Özkurt, Muzaffer Başak

## PURPOSE

To assess tear function in radiologists.

## MATERIALS AND METHODS

The study included 71 volunteers divided into 2 groups; 36 radiologists (Group 1) and 35 non-radiologist controls (Group 2). The noted ophthalmologic symptoms in both groups were burning, stinging, redness, sensation of a foreign body, photophobia, and blurred vision. Schirmer's 1 and tear break-up time tests were used to assess tear function.

## RESULTS

The distribution of eye symptoms in Group 1 was as follows: 16 radiologists (44.4%) presented with burning and stinging, 17 (47.2%) with the sensation of a foreign body, 23 (63.8%) with redness, 11 (30.5%) with blurred vision, and 5 (13.8%) with photophobia. As for Group 2, the following symptoms were noted: burning and stinging in 8 (22.8%), sensation of a foreign body in 5 (14.2%), redness in 6 (17.1%), blurred vision in 3 (8.5%), and photophobia in 1 control volunteer (2.8%). Tear break-up time test scores were 8.4 for Group 1 and 15.4 for Group 2, whereas Schirmer's 1 test scores were 9.1 and 16.1 for Groups 1 and 2, respectively.

## CONCLUSION

As a conclusion, dry eye syndrome occurs significantly more frequently in radiologists compared to non-radiologist. The working conditions and circumstances, including air-conditioned rooms, use of negatoscopes, and exposure to diagnostic radiation may be possible causative factors of this statistical outcome.

*Key words:* • dry eye syndrome • radiologist

**D**ry eye syndrome is a complex of symptoms in which complaints increase in situations that lead to increased vaporization of tears, such as air conditioning or wind, and in conditions that lead to a decrease of the blinking reflex, such as long-term reading and computer monitor use. Symptoms are seen when changes occur in the production, ingredients, and stability of tears, and in alterations in the epithelial structure of the conjunctiva and cornea. There are several methods used to evaluate tear production, but among them, the most widely used are Schirmer's 1 test (ST) and tear break-up time test (TBTT) (1–3).

As in many professions that require long-term computer monitor use, radiologists also work extensively with computers and monitors in daily practice, which leads to a diminished blinking reflex. In offices where radiologists work, air conditioners that lead to increased tear vaporization are often used. These working conditions, which are also valid for other professions, predispose workers to dry eye syndrome. But for radiologists, in addition to these mentioned working conditions, there are other predisposing factors like working in front of a negatoscope and diagnostic radiation exposure, both of which lead to a decrease of the blinking reflex. It is known that all of the aforementioned conditions predispose individuals to dry eye syndrome (3–5). In our study, we investigated the subjective complaints of radiologists related to dry eye syndrome and measured alterations of tear secretion with ST and TBTT. Our aim was to clarify the prevalence of dry eye syndrome among radiologists and compare it to a non-radiologist population.

## Materials and methods

The study included 36 radiologists (Group 1) and 35 non-radiologist controls (Group 2). Mean age was 32.4 years (range, 26–51 years) in Group 1 and 34.2 years (range, 24–52 years) in Group 2. There was no statistically significant difference in age or sex between the 2 groups. Group 2 included volunteers without a prior history of myopia, hypermetropia, or systemic and ocular disease. In order to avoid affecting the study results, people who used computers extensively, worked in offices with air conditioning, and were exposed to radiation were excluded from Group 2. Except for this, no exclusion was made in terms of jobs. As such, we aimed to statistically clarify the effect of work conditions on dry eye syndrome among radiologists, rather than among other professions. Contact lenses are known to lead to dry eye syndrome; therefore, contact lens users were excluded from the study. Additionally, volunteers with a known systemic disorder and those using drugs that may lead to dry eye syndrome were also excluded from the study. Each participant received a routine eye examination and was asked if they were experiencing any dry eye symptoms. In the anamnesis, burning, stinging, redness, sensation of a foreign body,

From the Department of Radiology (H.Ö. ✉ drhozkurt@yahoo.com, M.B.), Şişli Etfal Training and Research Hospital, Istanbul, Turkey; and Department of Ophthalmology (Y.B.Ö.), Kartal Training and Research Hospital, Istanbul, Turkey.

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photophobia, and blurred vision were investigated. Study groups were statistically compared with Fisher's exact test. Tear function was evaluated with ST and TBTT. For ST, standard Schirmer's filter paper was used without an anesthetic medication. First 5 mm part of the paper was folded then placed under the lower 1/3 of the outer conjunctival fornix. The paper was removed after 5 min and the amount of wetness was measured from the 5 mm notched part. For TBTT, fluorescein was dropped into the eye and the volunteer blinked a few times. Then, the time interval between the last blink under blue light and vision of the first dark field was calculated. Values < 10 seconds were accepted as pathologic. Those with pathologic results after both tests were diagnosed as dry eye syndrome. Results were compared by Mann-Whitney test. *P* values < 0.05 were considered as statistically significant.

## Results

The study included 71 volunteers, 36 of whom were radiologists (Group 1) and 35 were non-radiologist controls (Group 2). Group 1 consisted of 17 females (47.2%), whereas there were 18 females (51.4%) in Group 2. Mean age was 32.4 years (range, 26–51 years) in Group 1 and 34.2 years (range, 24–52 years) in Group 2. There was no statistically significant difference in age or sex between the 2 groups. Mean duration of working as radiologists in Group 1 was 5.3 years. There were significantly more subjective complaints among the volunteers in Group 1 than the complaints in Group 2 (Table). TBTT scores were 8.4 in Group 1 and 15.4 in Group 2 (*P* < 0.0001), while ST scores were 9.1 and 16.1 for Groups 1 and 2, respectively (*P* < 0.0001). Regarding all of these re-

sults, 21 volunteers (58.3%) in Group 1 and 4 (11.4%) in Group 2 were diagnosed with dry eye syndrome and the difference between groups was statistically significant (*P* < 0.0001).

## Discussion

The term dry eye refers to a complex of chronic symptoms that occur secondary to changes in the eye surface, cornea, and conjunctiva epithelium as a result of aqueous insufficiency or increased tear vaporization. Many disorders were found responsible in its etiology. Dry eye occurs as a result of impairment of the dynamic stability of the tear film layer due to several factors. Increased tear vaporization and osmolarity leading to changes in the frequency and amplitude of blinking, and environmental factors like dust and moisture imbalances may lead to dry eye complaints (3).

There are several studies about the alteration of blinking function secondary to mental activities, such as reading, memory recall, and excitement (5). Moreover, computer use diminishes blinking function. Acosta et al. reported a blinking function frequency of 12 per min in normal individuals that decreased 50% during computer use (5).

There are studies that suggest there are additional effects of diagnostic radiation exposure on the occurrence of dry eye (4). In their daily practice, radiologists are exposed to radiation in varying doses, and this is another factor leading to dry eye. Gurdal et al. reported that the prevalence of dry eye is higher among radiology technicians than it is in the general population (4).

Diagnostic criteria, however, are not completely standardized. Because of this, in severe cases, the diagnosis is easy, but mild cases are more difficult

to diagnose. There are several methods for the assessment of tear secretion. Among them, ST and TBTT are widely used because they are easily administered, fast, and inexpensive (1, 6, 7). Due to these reasons, we used ST and TBTT for the assessment of tear secretion.

Considering the working conditions of radiologists, there are many factors involved in dry eye syndrome. One of them is the negatoscope, which is a standard and inevitable tool of radiology, and in most radiology departments, negatoscopes are used in order to evaluate plain films. Another factor is working for long durations in front of computer monitors. In addition to all radiology machines having monitors, computer use for making film reports leads to spending a great amount of time in front of monitors. Moreover, recently, the incidence of film evaluation with monitors is increasing. All of these situations lead to a decrease of blinking function secondary to focusing on only one point. Additionally, extensive reading is not only specific to radiologists, but also is valid for all physicians and is also among the factors leading to decreased blinking function. Air-conditioned environments lead to dry eye since they cause tear evaporation. Most radiology departments are air conditioned in order to keep the associated machinery functioning properly, and this also contributes to dry eye syndrome.

Treatment of dry eye consists of adequate and regular use of artificial tear-drops. Additionally, punctal occlusion, moisturizing creams, mucolytic agents, and bandage contact lenses are other treatment options. As a rule, initial use of the easiest method is beneficial (8). Moreover, in cases involving long-term computer use, extensive reading, and negatoscope use that lead to decreased blinking reflex, prophylactic artificial tear-drop preparations can be used.

We found a higher incidence of dry eye syndrome in radiologists than in non-radiologist, and the difference was statistically significant. When working conditions of radiologists are considered, we believe that precautions should be taken for diagnosis and treatment of dry eye syndrome.

Subjective complaints of individuals included in the study

	Group 1 (n) n=36	Group 2 (n) n=35	<i>P</i> value*
Burning, stinging	16	8	0.07
Sense of foreign body	17	5	< 0.05
Redness	23	6	< 0.05
Blurred vision	11	3	< 0.05
Photophobia	5	1	0.19

\* *P* values < 0.05 were considered as statistically significant.

## References

1. Uçakhan ÖU, Alaçayır F, Fırat E, Özkan M. Kontakt lens kullanan olgularda gözyaşı salgısının gözyaşı kırılma zamanı ve schirmer testi ile değerlendirilmesi. *T Oft Gaz* 2000; 30:700-707.
2. Cho P, Yap M. Schirmer test I. A review. *Optom Vis Sci* 1993; 70:152-156.
3. Holly FJ, Lemp MA. Tear physiology and dry eyes. *Surv Ophthalmol* 1977; 22:69-87.
4. Gürdal C, Aydın S, Onmuş H, Şengör T, Özarar M. Change in the ocular surface: initial observations from a pilot study of diagnostic radiology technicians (radiographers). *Eur Radiol* 2002; 12:1589-1593.
5. Acosta M.C, Gallar J, Belmonte C. The influence of eye solutions on blinking and ocular comfort at rest and during work at video display terminals. *Exp Eye Res* 1999; 68:663-669.
6. Korb DR. Tear film-contact lens interactions. *Adv Exp Med Biol* 1994; 350:403-410.
7. Cho P, Yap M. Schirmer Test II. A clinical study of its repeatability. *Optom Vis Sci* 1993; 70:157-159.
8. Şengör T. Konjonktiva hastalıkları. In: Aydın P, ed. *Temel göz hastalıkları*. Ankara: Güneş Kitabevi, 2001;136-144.