

# Three-Minute Schirmer Test

## Üç Dakikalık Schirmer Testi

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**ABSTRACT Objective:** The standard Schirmer test is frequently suggested for the diagnosis of dry eye syndrome, but is rarely used by most ophthalmologists in daily practice because of the 5-minute timeframe. We aimed to evaluate the reliability of the 3-minute Schirmer test compared to that of the standard 5-minute Schirmer test. **Material and Methods:** This prospective, randomized study included 240 eyes of 240 healthy subjects. The study subjects were randomized into two similar groups. The basal Schirmer tear test with topical anesthesia was performed for 5 minutes in group 1 and for 3 minutes in group 2. The Schirmer test was performed for each subject on the right eye. The reliability of the 3-minute Schirmer test was evaluated and the correlation between the 3-minute and 5-minute test results was assessed. **Results:** Mean age of the subjects was  $39.65 \pm 16.93$  in group 1 and  $38.41 \pm 17.04$  in group 2. Group 1 included 64 females and 56 males. Group 2 was composed of 62 females and 58 males. There was no statistically significant difference between the groups with regard to age or gender. Mean Schirmer results were  $14.44 \pm 7.24$  mm (3-35) and  $10.86 \pm 5.96$  mm (2-30) in group 1 and group 2, respectively. An extremely high correlation between the 3-minute and the 5-minute test results was detected ( $p < 0.001$ ,  $r = 0.761$ ). **Conclusion:** Our results reveal that the 3-minute Schirmer test is a reliable alternative for the diagnosis of dry eye and it is more useful in daily ophthalmology practice.

**Key Words:** Dry eye syndromes; keratoconjunctivitis sicca

**ÖZET Amaç:** Standart Schirmer testi, kuru göz sendromu tanısı için sıklıkla önerilmektedir. Fakat bu test 5 dk.lık uygulama süresinden dolayı çoğu göz hastalıkları uzmanı tarafından günlük uygulamalarda nadiren kullanılmaktadır. Biz bu çalışmada, üç dakikalık Schirmer testinin güvenilirliğini ve 5 dk.lık Schirmer testi ile uyumunu değerlendirmeyi amaçladık. **Gereç ve Yöntemler:** Bu prospektif, randomize çalışmaya 240 sağlıklı olgunun 240 gözü dahil edildi. Olgular rastgele 2 benzer gruba ayrıldı. Grup 1'deki olgulara damla anestezisi ile standart 5 dk.lık bazal Schirmer testi uygulandı. Grup 2'deki olgulara ise yine damla anestezisi sonrası üç dakikalık Schirmer testi uygulandı. Schirmer testi, tüm olgularda sağ göze uygulandı. 3 dk.lık Schirmer testinin güvenilirliği ve standart 5 dk.lık testle uyumu değerlendirildi. **Bulgular:** Çalışmaya dahil edilen olguların ortalama yaşı, grup 1'de  $39.65 \pm 16.93$  yıl, grup 2'de  $38.41 \pm 17.04$  yıl idi. Grup 1; 64 kadın, 56 erkek ve grup 2; 62 kadın, 58 erkek olgu içeriyordu. Yaş ve cinsiyet bakımından 2 grup arasında istatistiksel olarak anlamlı fark yoktu. Ortalama Schirmer sonuçları grup 1'de  $14.44 \pm 7.24$  mm (3-35) ve grup 2'de  $10.86 \pm 5.96$  mm (2-30) idi. 3 dk.lık test sonuçları ile 5 dk.lık test sonuçları arasında ileri derece yüksek uyum saptandı ( $p < 0.001$ ,  $r = 0.761$ ). **Sonuç:** Bulgularımız, 3 dk.lık Schirmer testinin kuru göz tanısında güvenilir bir alternatif olduğunu ve bu testin göz hastalıkları poliklinik uygulamaları için daha uygun olduğunu düşündürmektedir.

**Anahtar Kelimeler:** Kuru göz sendromu; keratokonjunktivitis sicca

**D**ry eye syndrome and keratoconjunctivitis sicca are synonymous terms which state a group of disorders characterized by specific ocular symptoms related to abnormal or decreased tear production or excessive evaporation.<sup>1-3</sup> Schirmer test, developed by the German ophthalmologist, Otto WA Schirmer in 1903, is most commonly used in the evaluation of the humor aqueous production.<sup>4-6</sup> It shows the basal tear secretion when performed with topical anesthesia.<sup>1</sup> In this test, standard filter paper is placed in the lower 1/3 lateral fornix and the wetting distance is measured in millimeters after 5 minutes. However, it is impractical for most ophthalmologists to perform routinely because of the 5-minute timeframe. In addition, a significant dry eye symptom was reported by 14.6-44% of the subjects in some population-based studies.<sup>7-9</sup> In this condition, in a typical office-based practice, if an ophthalmologist sees 30 patients per day and 10 have at least some symptoms of dry eye, the physician has to spend more than 50 minutes every day for the Schirmer test alone. Hence, we think that a shorter duration test for dry eye diagnosis can be more practical.

In this study, we aimed to evaluate the reliability of the 3-minute Schirmer test compared to that of the standard 5-minute basal Schirmer tear test.

## MATERIAL AND METHODS

This prospective, randomized study included 240 volunteers. Informed consent was obtained from all subjects. Local ethics committee gave approval for this study. The study protocol followed the guidelines of the Declaration of Helsinki. Participants included patients, employees and students at the Kahramanmaraş Sütçü İmam University, Faculty of Medicine, Kahramanmaraş, Turkey. 40 subjects were selected for each decade between 10-70 years. History of ocular surgery or ocular trauma, ocular surface disorder, current contact lens use or topical medicine use, any systemic disorder such as the Sjögren syndrome giving rise to dry eye was considered an exclusion criterion.

All subjects underwent complete ophthalmic examinations including corrected visual acuity, biomicroscopic anterior segment examination and fundus examination.

The study subjects were randomized into 2 similar groups. The basal Schirmer tear test after topical anesthesia was applied for 5 minutes in group 1 and for 3 minutes in group 2. The Schirmer basal secretion test was performed for each patient on the right eye in the following manner: topical anesthetic was applied to the eye, and the conjunctival fornix was dried with a cotton tip applicator. After a 2-minute waiting period, Standard Whatman No. 41 filter paper strip, 5 mm wide and 35 mm long (Whatmann, Maidstone, UK), was folded 5 mm from one end and was placed between the lower eyelid and the globe, taking care not to touch the cornea, at the junction between the middle and lateral third of the eyelid. The patient was allowed to blink normally.

## Statistical Analysis

Statistical analyses were performed with the Student's t-test for ages and with the chi-square test for genders. Since normal distribution failed in both groups ( $p < 0.001$ ), the correlation between the 3- and the 5-minute Schirmer results was evaluated with the Spearman's correlation coefficient. A  $p$  value less than 0.05 was considered statistically significant.

## RESULTS

Demographic features of the subjects are presented in Table 1.

Mean Schirmer results were  $14.44 \pm 7.24$  mm (3-35) and  $10.86 \pm 5.96$  mm (2-30) in group 1 and group 2, respectively (Table 2). There was an extremely high correlation between the 3-minute and the 5-minute test results ( $p < 0.001$ ,  $r = 0.761$ ) (Figure 1).

## DISCUSSION

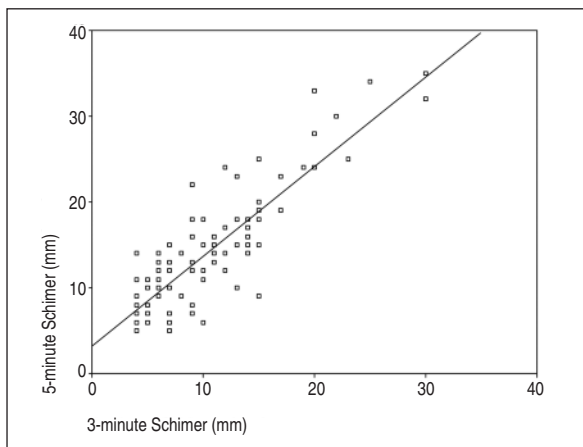
Dry eye syndrome is a clinical condition characterized by deficient tear production or excessive tear evaporation. Schirmer test is the most commonly

**TABLE 1:** Demographic features of the subjects.

	Group 1 (5-minute test)	Group 2 (3-minute test)	p
Age (mean±sd, years)	39.65 ± 16.93	38.41 ± 17.04	p> 0.05
Range	10-68	11-70	
Sex (F/M)	64/56	62/58	p> 0.05

**TABLE 2:** Schirmer test results.

	Group 1 (5-minute test)	Group 2 (3-minute test)
Schirmer test results (mean±sd, mm),	14.44 ± 7.24	10.86 ± 5.96
Range	3-35	2-30

**FIGURE 1:** The relationship between the 3-minute Schirmer and the 5-minute Schirmer test results ( $p < 0.001$ ,  $r = 0.761$ ).

used test to evaluate tear deficiency. The test can be performed with or without topical anesthesia. In theory, when the Schirmer test is performed without anesthesia, it measures basic and reflex secretion, whereas when it is performed with anesthesia it measures only basic secretion. A normal result is over 15 mm without anesthesia and slightly less with anesthesia. Between 6 and 10 mm is borderline and less than 6 mm without anesthesia or less than 5 mm with anesthesia indicates impaired tear secretion.<sup>10</sup>

The Schirmer basal secretion test has 5-minute duration. Unfortunately, this test is quite impractical in most ophthalmologists' everyday practice. To overcome this problem, we evaluated

the reliability of the shorter version of the test in normal subjects, using the 3-minute test.

We used the Schirmer test with anesthesia in order to inhibit the reflex aqueous secretion because the quantity of reflex secretion may be various in different subjects.

In this study, the mean wetting was approximately 15 mm in the 5-minute group. This is similar with normal Schirmer values in the literature.<sup>11,12</sup> In the 3-minute group, the mean wetting was 11 mm approximately. It was not possible to compare this value due to the lack of a similar report performed on normal subjects in the literature. Bawazeer and Hodge performed a study in subjects with dry eye and found the Schirmer score 6.78 mm for the right eyes and 7.73 mm for the left eyes at 3 minutes.<sup>13</sup>

In our study, a very high correlation between the 3-minute and the 5-minute wetting values was detected ( $p < 0.001$ ,  $r = 0.867$ ). However, we do not know the cutoff values of the 3-minute test for mild or severe dry eye. Bawazeer and Hodge measured the wetting values at 30 seconds and at 1, 2, 3, 4, and 5 minutes.<sup>12</sup> They showed that at even 1 minute, the correlation between this time point and the 5-minute test was high and it was extremely high at 2 minutes. Furthermore, a cutoff of 2 mm or less classified all patients as severe dry eye (using 5 mm or less from the 5-minute test) and a cutoff of 6 mm or less classified most patients as mild/moderate dry eye (using 10 mm or less from the 5-minute test). The authors suggested that the 5-minute Schirmer test with anesthesia could be replaced by the 1-minute test (using 2 mm as a cutoff for severe dry eye and 6 mm as a cutoff for mild/moderate dry eye). In fact, the 1-minute test can save a significant time in everyday practice. However, the wetting will also be too small in normal subjects because the duration is too short. In this case, the differentiation of the normal subjects from abnormal subjects may be very hard.

## CONCLUSION

Our results reveal that the 3-minute Schirmer test correlates highly with that of the standard 5-minute test. The 3-minute Schirmer test can be used in

the diagnosis of dry eye syndrome instead of the standard 5-minute test. We suggest that additional studies should be performed in order to detect the cutoff values of this timeframe in mild or severe dry eye syndrome.

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