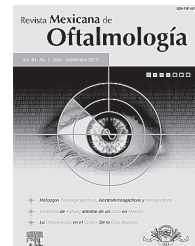




Revista Mexicana de Oftalmología

www.elsevier.es



Original article

Schirmer I Test and Break-Up Time Test Standardization in Mexican Population Without Dry Eye

Estandarización de las pruebas de Schirmer tipo I y tiempo de ruptura de la película lagrimal en población mexicana sana sin ojo seco

Fermon S,^{1,2} Ball S,² Paulin JM,^{1,2} Davila R,^{1,2} Guttman S.¹

¹Centro Oftalmológico Interlomas. Mexico City.

²Instituto de Oftalmología. Fundación Conde de Valenciana. Mexico City.

Keywords:

Schirmer, dry eye, BUT (Break up time), Mexico.

Abstract

Objective: To standardize the Schirmer test I and tear break up time results in a group of healthy people from a Mexican Ophthalmological Hospital.

Method: A Schirmer test and a tear film break up time test were realized in healthy individuals who had filled out a previous dry eye questionnaire. The results were recorded and a statistical analysis was done.

Results: We collected data from 747 patients, 381 men and 366 women, with an average age of 34.5 years old. Regarding the Schirmer test

Resumen

Objetivo: Estandarizar los resultados de las pruebas de Schirmer tipo I y el tiempo de ruptura de la película lagrimal en un grupo de pacientes sanos en un hospital de oftalmología mexicana.

Método: Realizamos un cuestionario sobre ojo seco, para incluir en nuestro estudio aquellos pacientes que no presentaban síntomas. Posterior a esto, realizamos la prueba de Schirmer y el tiempo de ruptura de la película lagrimal a aquellos individuos sanos, anotando los resultados y realizando un análisis estadístico.

Palabras clave:

Schirmer, ojo seco, TRPL (tiempo de ruptura de la película lagrimal), México.

we obtained an average of 8.64 mm, while in the break up time test we obtained an average of 7.60 seconds. In the Schirmer test we found an average of 8.59 mm for women and 8.71 mm for men, and for the break up time test we found an average of 7.59 seconds for women and 7.63 seconds for men finding no statistical significance in the difference of these results.

Conclusion: We conclude that in Mexican people, the average of the Schirmer test and break up time test is shorter than other reports. We propose to set a new “normal standard” of the test in order to classify dry eye syndromes.

Resultados: *Obtuvimos información de 747 pacientes, 381 hombres y 366 mujeres, con edad promedio de 34.5 años. En cuanto a la prueba de Schirmer se obtuvo un promedio de 8.64 mm, mientras que en el tiempo de ruptura de la película lagrimal se obtuvo un promedio de 7.60 segundos. En la prueba de Schirmer se encontró un promedio de 8.59 mm para mujeres y 8.61 mm para hombres y para el tiempo de ruptura de la película lagrimal se encontró un promedio de 7.59 segundos para mujeres y 7.63 segundos para hombres, sin encontrar una diferencia significativamente estadística en estos resultados.*

Conclusiones: *Se puede concluir que en la población mexicana el promedio de la prueba de Schirmer y el tiempo de ruptura de la película lagrimal es menor que en otros estudios. Proponemos establecer un nuevo “estándar normal” de estas pruebas con el fin de clasificar bien los síndromes de ojo seco.*

► Introduction

Dry eye syndrome is a common ophthalmological problem, with a prevalence that can arise even to 73% of the patients, which has a great economic impact and generates a lot of symptoms in the patients.¹⁻⁴ it can produce mild symptoms,⁵ but also lead to full incapacity.^{6,7}

There are two clinical ways to determine the tear film's quantity and quality,^{8,9} one is the Schirmer test^{10,11} and the other one is the break up time test,^{12,13} both susceptible to do at the doctor's office with mild invasion to the patient.¹⁴

There isn't a generalized consensus nor either a standardization of these parameters¹¹ about the Schirmer test and the break up time¹⁵ in Mexico, so some authors' don't give great importance to them,¹⁶⁻¹⁸ while some others base their studies on these criteria.^{19,20}

Schirmer test consists on putting a filter paper strip inside the inferior cul-de-sac, between the external half of the inferior palpebral and bulbar conjunctiva, with part of this strip hanging from the eyelid. The expected is the wetting of the strip no more of 15 mm in the first two minutes.²¹ The

tear film break up time is the time that takes from the first blink to the presence of the first desiccation zone.¹³

The technique consists on putting the patient at the biomicroscope, without air drafts, with the slit lamp, and observing at approximately 10 magnifications so we can see simultaneously the whole cornea. The patient blinks and we determine how long it takes to appear the first desiccation zone.^{22,23} The test should be repeated at least three times²⁴ without intermediate interruptions and the three results should be written. Usually, in the same test, the three values appear at similar times, and frequently in the same spot.

Normal values are considered over 15 seconds. Mildly low values go from 11 to 15 seconds, moderately low values from 6 to 10 seconds and very low from 0 to 5 seconds.

► Methods

A study was done at the *Instituto de Oftalmología Fundación Conde de Valenciana* where we did the Schirmer type I test with topic anesthetic application and a tear film break up time to the patients

from this hospital. The sample was obtained from those patients with less than 13 points in the dry eye questionnaire. The questionnaire used was the Benitez del Castillo questionnaire (**Table 1**).²⁵ We included all patients without dry eye symptoms with a score lower than 13 points, with any visual acuity and any refraction, and willing to be submitted to the study. We excluded all patients with dry eye symptoms, with a score higher than 13 points, patients who were unable to submit to the Schirmers test or the break up time test, with allergic response to the fluorescein, and patients using any ocular treatment in the last month.

For the making of the Schirmer test, we anesthetized the patients with sodic propacaine, 1 drop in each inferior cul-de-sac and we did the test ten minutes later. We put the TEAR FLO™ (Rose Stone Enterprises 9622 Baseline Road, Alta Loma, CA 91701) filter paper strips in one or both eyes to the patient while he kept blinking normally for five minutes, sitting in the exploration chair without any heavy lights or air drafts. Five minutes later, we extracted the strip and wrote down the millimeters moistened in the part of the strip that wasn't inside the eye. If the 30 mm moistened before the five minutes time had passed, then we extracted the strip and wrote down how long it took.

For the tear film break up time test, we put the patient at the biomicroscope, without any air current, with the lid lamp, and looking with 10 magnifications so we could see the whole cornea simultaneously. The patient was asked to blink and we determined how long it took for the first desecation zone to appear, writing down the number in the data paper.

Results

The sample obtained was from 747 patients, 381 men and 366 women, ages going from 18 to 77 years old, with an average of 34.5 years old. Regarding the Schirmer test, we obtained an average of 8.64 mm, with a standard deviation of 1.76 (6.88-10.4). In the tear film break up time test, we obtained an average of 7.60 seconds, with a standard deviation of 1.41 (6.19 - 9.01). The results obtained for women and men for the Schirmer test were an average of 8.59 mm for women and 8.71 mm for men. For the tear film break up time test, the data obtained was an average of 7.59 seconds for women and 7.63 seconds for men. As we can

Table 1. The questionnaire used was:

Eye Redness
Swelling of the lid margin
Lid's scales
Difficulty to open the eyes in the morning
Eye discharge
Eye dryness
Foreign body sensation
"Sand-like" sensation
Burn sensation
Itchiness
General eye discomfort
Sharp eye pain
Tearing
Watery eyes
Discomfort to light
Transient burning vision, improves with blinking
Tired eyes feeling
Heaviness eye sensation

Each one of these symptoms will be classified according to the severity during the last week using the following scale:

0: Doesn't have the symptom

1: A few times a week

2: A few times a week but doesn't create discomfort

3: Frequently, generates discomfort but doesn't interfere with activities

4: Frequently, generates discomfort and interferes with activities

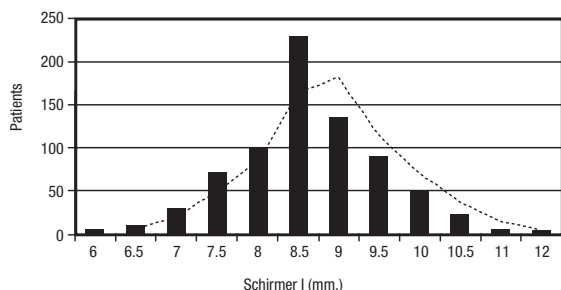
see here, the difference we found in the results for women and men were of no statistical significance (**Figures 1-4**).

Discussion

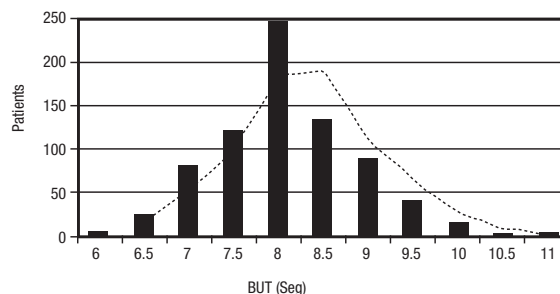
The best quantitative way to measure the tear production is the Schirmer test and the tear film break up time test. In this study, we chose the type I Schirmer test and the break up time test with local anesthesia, because with anesthesia we can partially isolate the basal secretion from the reflex tearing increasing the sensitivity of our study.

For a long time, the values used for the Schirmer test and the break up time test for diagnosis and for investigation purposes have been higher than those we have found in our study. Due to that in our daily practice we started noticing

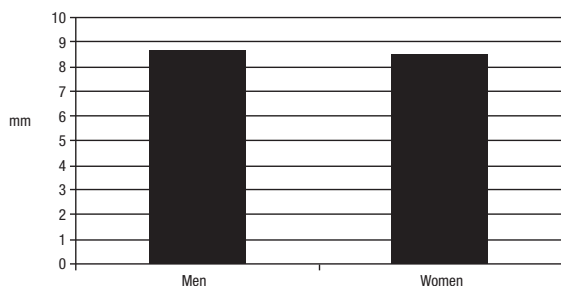
► **Figure 1.** Schirmer I test.



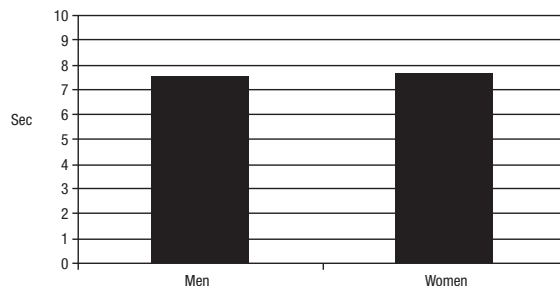
► **Figure 2.** Tear film break-up time test.



► **Figure 3.** Schirmer test.



► **Figure 4.** Break up time test.



lower values in healthy patients, and since there isn't a consensus about what the normal values should be, we decided to perform this study.

Our study showed lower average values, on our population, than those found in the literature, so it might be interesting to perform further studies in different types of population that may suggests that our values can be related to environmental or racial factors.

The normal Gaussian distribution and the correlation between the two tests make us think that the results are statistically significant. It is also interesting to mention that we didn't find any statistical difference between the two tests, comparing men and women. The Schirmer and the break up time are very easy to test, inexpensive and do not represent any risk for the patient. Also, when made with an adequate normal standard value,

the tests can provide very valuable information for the classification of our dry eye patients.

In further studies, we will look for a correlation between these non dry eye patients, the new values we found, conjunctiva cytology and tear osmolarity, so we can try to create a new qualitative, quantitative and histological classification for this group of patients.

References

1. Schirra F, Ruprecht KW. Dry Eye, an update on epidemiology, diagnosis, therapy and new concepts. [Review], *Ophthalmologie* 2004;101:10-8.
2. Dalzell MD. Dry eye: prevalence, utilization, and economic implications. *Managed Care* 2003;12:9-13.
3. Chia EM, Mitchell P, Rochtchina E, et al. Prevalence and associations of dry eye syndrome in an older population: the Blue Mountains Eye Study. *Clin & Exp Optal* 2003;31:229-32.
4. Jie Y, Xu L, et al. Prevalence of dry eye among adult Chinese in the Beijing Eye Study. *Eye* 2009;23:688-93.
5. Vicario DT, Herrero-Vanrell, Benítez DC, et al. New Formulations for Dry Eye Treatment. *Arch Soc Esp Oftalmol* 2007;82:395-396.

6. Montes-Mico R, Caliz A, et al. Wavefront analysis of higher order aberrations in dry eye patients. *J Refract Surg* 2004;20:243-7.
7. Rolando M, Lester M, Macri A, et al. Low spatial-contrast sensitivity in dry eyes. *Cornea* 1998;17:376-9.
8. Smith J, Nichols KK, et al. Current patterns in the use of diagnostic tests in dry eye evaluation. *Cornea* 2008;27:656-62.
9. Kaercher T, Bron AJ. Classification and Diagnosis of Dry Eye. *Dev Ophthalmol*. 2008;41:36-53.
10. Bawazeer AM, Hodge W. One-Minute Schirmer Test With Anesthesia. *Cornea* 2003;22:285-287.
11. Cho P, Yap M. Schirmer test I. A Review. *Optom Vis Sci* 1993;70:152-6.
12. Nichols JJ, Nichols KK, Puent B, et al. Evaluation of Tear Film Interference Patterns and Measures of Tear Break-Up Time. *Optom Vis Sci* 2002;79:363-9.
13. Mengher LS, Pandher KS, Bron AJ. Non-invasive tear film break-up time: sensitivity and specificity. *Acta Ophthalmologica* 1986;64:441-4.
14. Shapiro A, Merin S. Schirmer test and break-up time of tear film in normal subjects. *Am J Ophthalmol* 1979;88:752-7.
15. Stodtmeister R, Chris T, Gaus W. Factors influencing the variability of tear film break-up time. *Klinische Monatsblätter für Augenheilkunde* 1983;183:485-8.
16. Norn MS. Dessication of the precorneal film. I. Corneal wetting time. *Acta Ophthalmol* 1969;47:865-80.
17. Cho P, Yap M. Schirmer Test II. A Clinical Study of its Repeatability. *Optom Vis Sci* 1993;70:157-159.
18. Pflugfelder SC, Solomon A, Stern ME. The diagnosis and management of dry eye: a twenty-five-year review. *Cornea* 2000;19:644-9.
19. Lemp G. Cornea and Sclera. *Arch Ophthalmol* 1973; 90:08-21.
20. Macri A, Pflugfelder S. Correlation of the Schirmer 1 and fluorescein clearance tests with the severity of corneal epithelial and eyelid disease. *Arch Ophthalmol* 2000;118:1632-8.
21. Serin D, Karsloglu S, et al. A Simple Approach to the Repeatability of the Schirmer Test Without Anesthesia: Eyes Open or Closed? *Cornea* 2007;26:903-906.
22. Himebaugh NL, Begley CG, et al. Blinking and Tear Break-Up During Four Visual Tasks. *Optom Vis Sci* 2009;86:106-114.
23. Begley CG, Himebaugh N et al. Tear breakup dynamics: a technique for quantifying tear film instability. *Optom Vis Sci* 2006;83:15-21.
24. Cho P. Reliability of a Portable Noninvasive Tear Break-Up Time Test on Hong Kong-Chinese. *Optom Vis Sci* 1993;70:1049-54.
25. Donate J, Benítez del Castillo JM et al, Validation of a Questionnaire for the Diagnosis of Dry Eye. *Arch Soc Esp Oftalmol* 2002;77:493-500.