USING THE KERATOMETER MIRE AS A CLINICAL TOOL FOR TEAR FILM EVALUATION IN CONTACT LENS WEARERS

by

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INTRODUCTION

The evaluation of tear film quality is an essential portion in the examination of the contact lens patient. The mucin, aqueous, and lipid layers that make up the tears work together to maintain the health of the cornea, not only forming the most important refractive surface of the eye, but providing it's main source of nutrition, waste removal and antibacterial action(1). Deficiencies in the tear film can cause problems for the contact lens patient ranging from mild discomfort to significant lens intolerance which can ultimately compromise the health of the eye. Different techniques have been used clinically to assess the tear film quality. Methods such as the instillation of fluorescein to measure tear break up time (TBUT) have been criticized due to the invasive nature of the test which in itself may alter the tear film properties (2). Also, non-invasive techniques such as the Hirji-Callander grid (3) and the slit lamp bowl grid apparatus (4) have been suggested to measure TBUT without disrupting the tear film. The idea of using the standard keratometer mire to asses the sufficiency of the tear layer has been proposed (5), but not tested on contact lens wearing patients. This paper suggests that relevant, practical knowledge can be gathered using the standard keratometer mire as a clinical tool to quickly evaluate and quantify tear film quality in contact lens wearers.

SUBJECTS

Five women and two men participated in the study, ranging in age from 20-46 years. None of the subjects had a history of ocular pathology of the anterior segment or any known ocular allergies, and all were successful soft contact lens wearers.

MATERIALS AND METHODS

Using the standard keratometer mire and a simple stopwatch, the tear break-up time was measured before fitting the patient with contact lenses. This pre-fit TBUT was assessed by instructing the patient to blink normally then hold the eye open naturally. The break-up time was quantified by using the stopwatch to measure the time from the last full blink until the bottom right keratometer mire became distorted, broken, or could no longer be kept in focus. Three measurements were taken alternately for each eye with at least a ten second rest period between readings. These measurements were averaged to determine the TBUT for each eye. Each participant was then fit with Bausch and Lomb medalist frequent replacement soft contact lenses. After wearing the lenses for five minutes, the tear break-up time was again evaluated using the same technique as described above. Because all of the subjects were previous soft contact lens wearers, they were instructed to wear the lenses according to their normal schedule. The average wearing time was approximately fourteen hours per day. All subjects were instructed to clean and disinfect the lenses daily with the Bausch and Lomb Renu system and enzyme every seven days. After one week the TBUT was again evaluated, first while wearing the contacts then again after removing the lenses, allowing the tear film to stabilize for five minutes. The same procedure was repeated after two weeks, and finally again at four weeks, each time evaluating the TBUT with and without the lenses measuring the mire break-up time with the keratometer.

RESULTS

The results of the study suggest that the tear film was more stable when the subjects were not wearing the contact lenses. In all but one of the cases, the tear break-up time was decreased by a noticable amount five minutes after the initial contact lens application. The data also shows that throughout the four week period of the study, the tear film was consistantly less stable with the contact lenses in place.

SUBJECT:		1	2	3	4	5	6	7
PRE-FIT:	R:	08.68	03.73	27.28	25.31	04.14	07.03	04.70
	L:	26.50	06.39	25.12	28.74	07.94	06.29	04.81
5 MIN.	R:	01.52	06.09	03.73	02.03	00.64	02.28	00.46
POST-FIT:	L:	02.28	11.90	01.24	01.88	01.90	01.63	00.72
1 WK WITH	R:	03.62	04.41	07.08	01.68	01.18	01.05	*NO CM
CL'S:	L:	04.24	03.20	03.28	01.46	02.08	01.68	00.43
1 WK WITHOUT	R:	29.35	05.06	24.65	04.30	08.28	05.64	00.21
CL'S:	L:	31.52	09.15	22.33	03.33	06.37	06.49	04.70
2 WK WITH	R:	02.13	06.58	02.99	00.96	03.50	02.68	NO CM
CL'S:	L:	02.68	03.89	02.27	02.36	01.72	02.85	NO CM
2 WK WITHOUT	R:	14.24	06.52	03.92	04.25	12.50	05.74	05.12
CL'S:	L:	13.61	06.24	08.44	13.80	10.42	07.55	07.34
4 WK WITH	R:	01.06	03.14	02.89	03.86	00.68	03.24	NO CM
CL'S:	L:	01.99	03.40	02.56	01.36	00.56	02.40	00.12
4 WK WITHOUT	R:	17.57	04.62	08.51	10.85	07.40	05.73	02.68
CL'S:	L:	30.31	05.60	08.60	08.95	09.32	04.52	03.43

*NO CM= No clear mires could be assessed
**Note that all TBUT are rounded off to the nearest hundredth of a second

CONCLUSION

Many different methods have been advocated as a means of measuring the tear film stability. The current standard involving the instillation of fluorescein appears to function as a provocative test which shortens apparent tear break-up time (6). Although this technique is considered useful when used as a test for mucus deficient patients, it's variability amongst normal subjects merits criticism (7). The mire break-up time proposed in this study is difficult to compare to the other non-invasive tear film studies previously mentioned. Both the Hirji-Callander grid (8) and the slit lamp apparatus (9) studies were based on the tear film evaluation of non-contact lens wearing subjects. The keratometer mire break-up method is presented as an easily accessible clinical procedure to gather useful and practical data regarding the contact lens - tear film interface. Clinically it is important to utilize a technique that can quickly give information without disrupting the tear film. The keratometer is an excellent tool for detecting the presence of tear film instability. The keratometer mire becomes sharp instantaneously following a blink, but as tear break-up occurs, the mire becomes distorted (10). This method allows the practitioner to assess the tear film quality quickly and simply. The data from this study show that in a group of soft contact lens wearers there are measureable differences in the tear film stability with and without the contacts. An intact, smooth tear film coating on the anterior surface of a hydrogel lens enhances the biocompatibility of the lens with ocular tissue (11). This is an important factor in promoting comfortable and successful contact lens wear. Lens coating can become a factor effecting contact lens wear. During this study, however, there was no standard pattern noted in the tear break-up time over the four week wearing period. Wetability can vary depending primarily on the polymer's water content (12), the degree of ionization (13), lens deposits, as well as tear film thickness and can be evaluated using advanced methods such as tear film interferometry (14), however, these factors are beyond the scope of this paper.

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