

**Tearscope-plus: a portable option in
measuring tear break up time**

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Abstract

Twenty patients had the tear break up time measured in their right eye by the Tearscope-plus, utilizing the magnifier, the blue filter, and coarse grid options. The results were compared to the tear break up time measured by the traditional slit lamp method. Both methods required the use of fluorescein prior to measurement. The results showed that either method is accurate, and could be compared. The measurements were within 1.7 seconds, with a standard deviation of ± 1.3 seconds. The Tearscope-plus, therefore, is a good alternative to measuring TBUT if a portable option is desired.

Materials and Methods

Subjects varied in age from 11- 70 years old, with an average of 35 years old. Subjects were non-contact lens wears with no dry eye complaints and no corneal irregularities. Traditional TBUT was conducted at the conclusion of the slit lamp examination, after the instillation of fluorescein dye onto the bulbar conjunctiva of the right eye. Time was recorded with a second hand, and the measurement was taken at the first detection of tear film break-up. At this point, fresh fluorescein was added to the subject's right eye, and the hand held Tearscope-plus, using the magnifier, blue filter and coarse grid options, was positioned against the subject's brow and cheek. Proper clinician positioning was maintained and timing was conducted with the start and stop button on the scope.

Results

Table I. Patient data and results

Patient age (years)	Sex	Slit Lamp TBUT (sec)	Tearscope-Plus TBUT (sec)	Difference in readings (sec)
11	male	15	16	1
12	male	13	13.7	0.7
14	female	13	14	1
14	female	14	16	2
16	male	14	15	1
22	male	14	15	1
23	female	16	18.2	2.2
25	male	9	9	0
25	male	15	15.5	0.5
25	female	16	16.4	0.4
29	female	13	14.1	1.1
39	female	12	14	2
51	male	17	20	3
52	male	19	20	1
53	female	18	19	1
53	female	18	20.8	2.8
58	female	11	11.4	0.4
65	female	12	13	1
70	female	21	23	2

Discussion

The Tearscope-plus allows you to view the tear film non-invasively to make assessments that will help in fitting contact lenses and in treating dry eye symptoms. The Tearscope can be used in three ways: mounted on a slit lamp; hand held with a slit lamp; hand held with its own magnifier. The light of the Tearscope-plus provides a white background against which the tear film can be observed, and a range of filters, grids, and rings can be used to enhance examination.

In our experiment we wanted to find out how closely the Tearscope-plus could measure tear break up time compared to how we measure TBUT with slit lamp magnification and blue light with fluorescein. We used the scope with a magnifying lens to find out if this portable option is as accurate as the slit lamp method. This utilized the coarse grid, blue filter, and magnifying lens, which are only a few of the options offered.

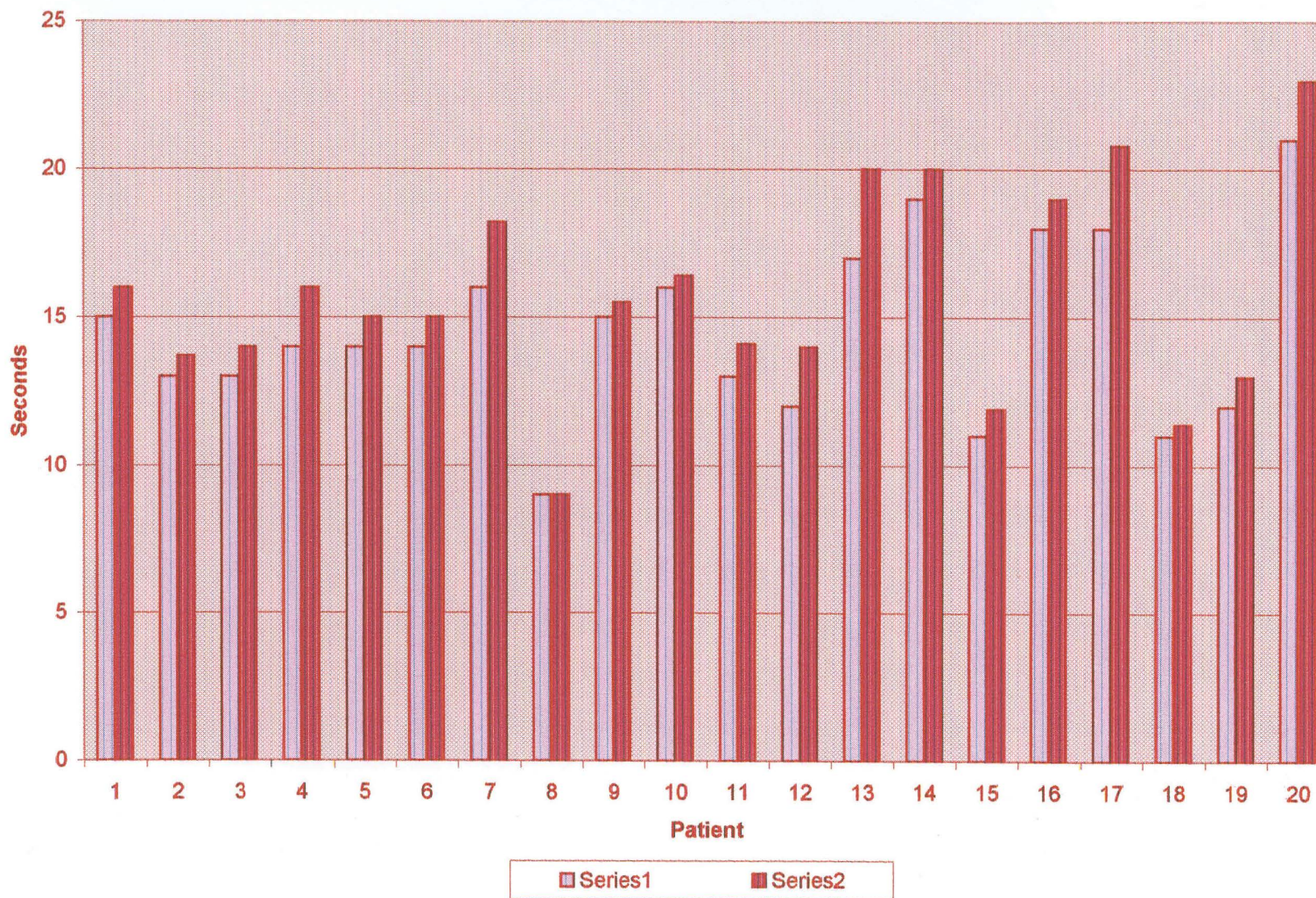
The Tearscope-plus has many accessories with which to become familiar in order to fully utilize what the instrument has to offer. The first allows the examiner to view the tear film hands-free, since it can be fitted to a slit lamp using the "R" tonometer mount. It can be focused by moving backwards and forwards, and can be easily moved aside for slit lamp use. The mount is available as an optional accessory. A magnifying lens can also be fixed onto the back of the Tearscope-plus. It focuses when the observer is close to the scope and gives a magnification increase of 2-3X when the image is viewed at 30 to 50 cm. The magnifying lens, with grids and filters provide an ideal portable instrument for looking at the tear film and for contact lens fitting. These are also optional accessories. The two removable grids, fine and coarse, show any disruption in the tear film. The NIBUT (non-invasive break up time) is measured by stopping the timer on the Tearscope when the break is seen. The fine grid with black lines on a transparent background is used with slit lamp magnification to view corneal discrepancies and problematic tear films. By moving the scope forward, the reflected image comes into focus with the tear film and is seen against the white background. The coarse grid works similarly but is used

without slit lamp examination. It allows for observation of irregularities in the corneal surface and detects poor tear films. The placido rings produce a series of fine concentric circles on the corneal surface, used to view any corneal distortion. This insert is another option. Fluorescein examination requires the use of blue and yellow filters. The blue filter is placed inside the scope, while the yellow filter is mounted in the magnifier. This combination allows the observation of any fluorescein stained tear film under low magnification and eliminates the need for an additional UV lamp. These filters are very helpful, and are used often. The last option for the scope utilizes a tapered tubular-designed diffuser tube to limit the effect of retroillumination. Therefore, the Tearscope-plus can be used as a perfect dark field examination device for detecting deposits on contact lenses. The deposits and scratches can be shown to the patient to emphasize the need to clean, replace, and polish lenses.

Conclusion

Keeler's Tearscope-plus was developed as a convertible option to the traditional slit lamp method of determining TBUT. We found that the Tearscope-plus offers reliable results, while offering the convenience of portability. Comparison of data from the conventional TBUT method against the Tearscope-plus showed a variation of +0.4 seconds to +3.0 seconds. One suggestion we can make is that if the Tearscope-plus is showing borderline dry eye TBUTs (around 10 seconds), a follow-up measurement using traditional slit lamp methods should be conducted to verify the finding before initiating any treatment.

Comparison of slit lamp results vs. tearscope-plus results



Series 1 represents slit lamp data. Series 2 represents tearscope-plus data.

References

Keeler. Tearscope-plus Instruction manual.

Keeler. Tearscope-plus Information manual.