Study determining the reproducibility of the non-invasive break-up time by corneal topographer (NIK-BUT) method for infrared, red and white illumination

Introduction:
Dry eye is one of the most common diseases in the world [1]. Every fifth person suffers from this disease [2].

Today measuring of tear film stability, is focused on non-invasive methods [3]. To determine the influence of the examiner, an objective analysis should be used. One of these novel non-invasive methods is the non-invasive keratograph break-up time (NIK-BUT). The NIK-BUT is known as the tear film break-up time measured by means of the video topographer.

Purpose:
The aim of this study was to measure the reproducibility of the non-invasive keratograph break-up time (NIK-BUT) using three different illuminations: infrared, red and white.

Methods:
Forty-eight subjects were enrolled (mean age (34.8 ± 15.2) years; 50% female, 50% male). The reproducibility of NIK-BUT (OCULUS Keratograph 4, Version: 1.76b53R1) was tested on three consecutive days at the same day time. Infrared, red and white illumination was examined in a randomised order. A comparison of the first break-up (NIK-BUT) and the average of all affected areas (NIKav-BUT) was made. Because of incorrect detection by the video topographer due to eyelashes, pupil light reaction and iris crypts, the values of the NIK-BUT have been adjusted (Figure 1).

Results:
Only the values of the NIKav-BUT with red illumination were normally distributed (n = 48, Shapiro-Wilk p=0.094). The results show that there is no statistical difference regardless of the illumination, which was used on three consecutive days (infrared illumination: NIKf-BUT, Friedman-Test p=0.090, NIKav-BUT, Friedman-Test p=0.243; white illumination: NIKf-BUT, Friedman-Test p=0.558, NIKav-BUT, Friedman-Test p=0.864; red illumination: NIKf-BUT, Friedman-Test p=0.763, NIKav-BUT ANOVA p=0.781). Between the illumination there are no statistical differences (p>0.05) apart from two exceptions (NIKf-BUT(r-r-re) day 2: p=0.01; day 3: p=0.005; Friedman-Test).

Conclusion:
Results of the non-invasive keratograph break-up time (NIK-BUT) on three successive days and between the three different illuminations were equal. The infrared illumination is the least invasive method to measure the NIK-BUT. This is why the illumination is recommended for practical use. The NIK-BUT method, using the three different illuminations, should be optimised in future studies, since the video topographer is detecting eyelashes, pupil light reaction and iris crypts as a tear film break-up.

References:

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