Established tear film assessment techniques today are based mostly on the
observation of generated tear film reflexes. A limitation of these procedures is
the subjective nature of the observation in principle. [1]. This fact, of course, greatly
influences the interpretation of tear compositional data and admits only a limited
comparison of the results. This source situation was the motivation for the
development and validation of an objective and automated technology to detect
the non-invasive tear film break-up time.

Methods:
The NIK-BUT was measured by a corneal topographer (OCULUS Keratograph 4)
and its new developed measuring software (TF-Scan), which allows a detection of
the non-invasive tear film break-up time automatically. A tear-map illustrates
affected areas according to the break-up time, whereas the first distortion of the
reflected Placido-disc (NIK-BUTf) and the average of all affected areas (NIK-
BUTav) are generated.

Results:
Within all methods no normal distribution was found (n=101; Shapiro-Wilk-Test).
The evaluation of the 101 subjects resulted in a median NIK-BUT of 10.8s
(mean=11.2±5.3s), a median NIKav-BUT of 15.1s (mean=14.4±5.2s).

ROC
For the comparison of the NIK-BUT with a combination of objective
(TMH, BUT, Schirmer I) and subjective (McMonnies DEQ) methods the results of the tear film
tests were devised in asymptomatically and symptomatically. The subjects were
classified as symptomatic if in the sum three of four tear film tests were classified
as critical or dry (grade 1 and 2). According to this criteria 82 of 101 subjects
were asymptomatic, 19 subjects of the group were symptomatic. The prediction
values of the NIK-BUT and the NIKav-BUT are significant (NIK-BUT:
AUC=0.679; p=0.016; NIKav-BUT: AUC=0.646; p=0.048 (Abb. 3 a)).
Furthermore an evaluation was carried out at which only the tests with the
highest sensitivity (BUT; DEQ) were considered. The results were significant and
with strong predictive power (NIK-BUT: AUC=0.750; p=0.000; NIKav-
BUT: AUC=0.735; p=0.000). The cut off values were NIKf-BUT≥10s and NIKav-
BUT≥14s (Abb. 3 b)).

Conclusion:
The NIK-BUT measurement represents one of the first objective and non invasive
tear film assessment techniques that supplies good classification results. Single
and high efficacy reference tests are particularly suitable for the determination of
the cut off values.

References:
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