THE REPEATABILITY OF TEAR FILM MEASUREMENTS IN SUBJECTS WITH DRY EYE

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INTRODUCTION
• In patients with dry eye disease, there is considerable variability in both objective measures of tear volume and tear function, and in subjective symptom reporting. This is challenging not only in the diagnosis of disease, but in understanding response to treatment and the natural history of the condition.
• Variability in subject populations and methods used to evaluate and report repeatability of tear film measurements makes it challenging to compare different measurement techniques. Therefore, it is desirable to investigate the repeatability of various tear film assessment techniques in a single cohort of symptomatic dry eye subjects.

AIM
To investigate the repeatability of tear film measurements in a symptomatic dry eye population, and to determine associations between tear film evaporation rate and other tear parameters.

METHODS
• Forty non-contact lens wearers with symptoms of dry eye (Ocular Surface Disease Index (OSDI) score >18)[2] were enrolled.
• Subjects attended up to four visits. Tear film characteristics measured included:
  • Absolute tear evaporation rate (TER: grams/square metre/hour (gm-2h)) measured with a modified VapoMeter (Delfin Technologies)[3] (Figure 1);
  • Fluorescein tear film break-up time (TBUT: sec): average of three measurements;
  • Lipid layer thickness (LLT: nm) with a LipiView (TearScience);
  • Un-anesthetized Schirmer I tear volume (TV: mm);
• Measurements were obtained for each eye, but data for the right eye only were used for the analysis.

DATA ANALYSIS
Coefficient of repeatability (COR, 1.96*within-subjects standard deviation was estimated for tear parameters. Associations were estimated using either Pearson or Spearman Rank correlation tests. Variables associated at p<0.2 were included in a stepwise ANOVA regression analysis to establish tear parameters which best predicted tear evaporation rate.

RESULTS
• Tear Film Measurements
  • Fourteen males and 26 females with average age 40.1 ± 19.8 years and OSDI score 40.2 ± 14.5 were enrolled.
  • The averages for TER, TBUT, LLT and TV, the corresponding COR, and the proportion of the COR relative to the measurement averages are shown in Table 1.

Associations
• Tear evaporation rate was moderately negatively associated with TBUT (r=-0.32, p<0.05) (Figure 2), LLT (r=-0.30, p = 0.05) (Figure 3) and positively associated with OSDI score (r=0.38, P<0.02) (Figure 4).

DISCUSSION AND CONCLUSIONS
• In this population of symptomatic dry eye subjects, when the COR was considered as a proportion compared to the measurement average, TER was the most repeatable measurement, followed by TBUT and then TER.
• The repeatability of LLT measurement in this dry eye population was marginally poorer compared to a non-dry eye population (COR 42.4 vs. 49 respectively)[3].
• Tear volume was the least repeatable measurement, which differs to previous reports of marginally better repeatability for TBUT in dry eye patients, when expressed as the average range/dynamic range between the maximum and minimum values for each test (19.8 ± 17.0% vs. 22.3 ± 17.6% respectively)[1].
• The coefficient of variation for average non-invasive tear break-up time (NITBUT) was similar in dry eye subjects compared to healthy subjects (17.3-18.1% vs. 17.4-19%), whereas tear meniscus height was more repeatable in dry eye subjects (16.0-16.1% vs. 18.9-19.8%)[3].
• This study found significant associations between TER and TBUT, LLT and OSDI score, whereas previously, no significant correlation was found between LLT and TBUT in a non-dry eye population[4].

REFERENCES

DISCLOSURES
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