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Poster Abstracts
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Cooling rate dynamics as a diagnostic indicator for dry eye disease: a comparative thermographic analysis

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Purpose: To determine whether ocular surface temperature (OST) cooling rates (CR) differentiate dry eye disease (DED) from non-DED, and to identify CR thresholds to predict DED.
Method: One randomly selected eye from 39 participants (27 females, 12 males; mean±SD age, 34.64±11.48 years) were imaged using ThermOcular’s synchronized thermal and visible cameras. Each participant made two complete blinks and then avoided blinking (MBI) while fixating on a target. Participants were divided into two groups: (DED = 14, non-DED = 25). (DED classification: OSDI >13; TBUT <5s). CR (°C/s) for entire cornea region, over time periods 3–8 s after eye opening (CR3–8) and maximum blink interval (CRMBI), were extracted. Mean ambient conditions during testing were 25.1±1.8°C and 46.2±5.3%, respectively. Group differences were assessed using Mann-Whitney tests, and diagnostic performance using ROC analysis. Optimal cut-offs were derived from Youden’s J index. The study followed the Declaration of Helsinki.
Results: CR was significantly faster in DED eyes (-0.10±0.04°/s) than non-DED eyes (-0.05±0.04°/s) across all time periods ($p<0.001$). Comparisons for time periods CR3-8 found consistent significant differences ($p\leq0.0005$) and good AUC (0.79 to 0.85). Strongest discrimination occurred for CRMBI (AUC, 0.90; cutoff, -0.05°C/s; sensitivity, 0.85; specificity, 0.92) and CR_5 (AUC, 0.89; cutoff, 0.06°C/s; sensitivity, 1.00; specificity, 0.68). CR correlated negatively with OSDI ($r=-0.43$ to -0.51; $p\leq0.01$), and positively with TBUT ($r=0.54$ to 0.61; $p \leq 0.004$) suggesting that faster CRs were associated with greater symptom severity and reduced tear film stability.
Conclusions: OST CR over entire cornea can distinguish DED from non-DED with high diagnostic performance. CRMBI offered the most clinically useful single parameter, with a DED CR cut-off ≤ 0.05°C/s, with good sensitivity and specificity. The moderate, but strong, relationship between tear stability and CR suggests that thermographic cooling metrics have potential for enhanced DED screening.

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