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Paper Abstracts
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Effect of regional variations in corneal surface cooling for dry eye disease diagnosis

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Purpose: To compare ocular surface temperature cooling rates (CR) between 6 corneal regions (ROI) and identify the most useful ROI and CR metric to predict dry eye disease (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 DED (n=14) and non-DED (n=25) groups. (DED classification: OSDI>13; TBUT<5s). Cooling rate (CR5, °C/s) over 5s post-blink period and maximum inter-blink interval (CRMBI) were analysed for six ROI (entire, central, superior, inferior, nasal, temporal). Group differences were evaluated using t-tests, and diagnostic performance using ROC analysis with Youden’s index to identify cut-offs. The study adhered to the Declaration of Helsinki.
Results: CR_5 and CRMBI were consistently more negative in DED eyes, indicating faster ocular surface cooling. CR_5: DED (-0.11±0.04°C/s) versus non-DED (-0.07±0.05°C/s; p=0.004), and CRMBI: DED (-0.09±0.04°C/s) versus non-DED (-0.04±0.03°C/s; p=0.003) across all ROI. All ROI showed significant DED/non-DED differences (p<0.02), with entire and central ROI showing the largest effects. CR was greatest centrally and temporally, and lowest nasally in both groups. For CR_5, AUCs ranged from 0.85–0.90, with entire (0.90) and temporal (0.89) ROI showing best diagnostic accuracy. For CRMBI, AUCs ranged from 0.84–0.90, with entire ROI performing best (AUC = 0.90, sensitivity = 0.86, specificity = 0.92). Overall, both CR_5 and CRMBI distinguished DED from non-DED eyes (mean AUC = 0.87).
Conclusions: DED shows faster inter-blink CR than non-DED. For all eyes, CR varied by ROI, with Entire Cornea giving the best diagnostic performance between DED and non-DED, for both CRMBI and CR5. For screening, CRMBI cut-off ≤-0.05°C/s balanced sensitivity and specificity, while CR5 cut-off ≤-0.06°C/s favoured sensitivity-driven screening.

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