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Poster Abstracts
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ThermOcular: a dual camera thermal–visible imaging system for dynamic ocular surface temperature measurement

Ehsan Zare Bidaki, Parvaneh Najafizadeh, Paul Murphy
Affiliation: School of Optometry and Vision Science, University of Waterloo

Purpose: To validate a dual camera (thermal and visible) imaging system (ThermOcular) for dynamic tracking of ocular surface temperature (OST) in healthy eyes.
Method: One randomly selected eye of 25 healthy participants (16 females, 9 males; mean ± SD age, 35.6±11.4 years) were imaged using ThermOcular. Mean ambient conditions during testing were 25.1±1.8°C and 46.2±5.3% RH, respectively. Each participant made two complete blinks and then avoided blinking (MBI), while fixating on a target. Image processing algorithms of the two video streams enabled clean extraction of corneal OST data. Baseline temperature immediately after eye opening (t_o), and cooling rate (CR) during post-blink period (3, 4, 5, 6, and 8 seconds from eye opening) and maximum inter-blink interval (CRMBI, °C/s) were analysed for six corneal regions (ROI) (entire, central, superior, inferior, nasal, temporal). Friedman tests examined between ROI effects, with Wilcoxon signed-rank tests for pairwise comparisons. The study adhered to the Declaration of Helsinki.
Results: Mean baseline OST (t_o) across all ROI was 34.00±0.92°C, decreasing to 33.59±1.11°C at MBI with minimal spatial variation across ROIs (Range: 0.24±0.09°C). CR were negative over all time periods, becoming progressively less negative over time (CR_3: −0.065, CR_6: −0.046, CR_8: −0.038°C/s). All six ROI demonstrated significant change in CR ($p<0.001$), indicating time-dependent cooling. Mean CRMBI (maximum cooling rate) measured −0.026±0.025°C/s. CR for central and temporal ROI were cooler than nasal ROI, but the differences were not statistically significant.
Conclusions: ThermOcular quantified OST dynamics with clear evidence of post-blink cooling and can analyse CR data for separate corneal ROI. CR can be analyzed over varied post-blink time periods. CRMBI showed most potential for characterising OST changes. These findings validate ThermOcular for research use and support future studies, including dry eye and contact lens wear, to explore OST CR as an objective, non-invasive marker of tear film behaviour.

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