Abstract Submitted
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**Mathematical Modeling of Tear Film Break up Modes and Fluorescent Intensity**[1] JAVED SIDDIQUE, Penn State York, RICHARD BRAUN, University of Delaware, C.G. BEGLEY, School of Optometry, Indiana University, Bloomington, IN, P.E. KING-SMITH, College of Optometry The Ohio State University, Columbus, OH — We develop a mathematical model for variables of interest in tear film break up (TBU) to compare with experimental images of TBU to better predict local values of tear film (TF) osmolarity and fluorescence during and following the TBU. Models are developed for local changes in TF thickness, osmolarity and fluorescein concentration. Fluorescence concentration was converted to fluorescent intensity using the expression involving film thickness and the full range of fluorescence (Nichols et al (IOVS 2012). The fluorescent intensity response is a primary tool for visualizing the TF thickness, and it is qualitatively different in the dilute vs concentrated regimes. Computed results over a wide range of fluorescein concentrations show that evaporation rate led to thinner regions where TBU first occurs. The computed results will be closely compared with experimential fluorescence and other imaging techniques to help determine relevant parameters. The model predicts locally elevated concentration of osmolarity within areas of TBU and predicts osmolarity in these regions which can't be measured experimental results to date. The osmolarity may increase from 50% to 1300% of the isosmolar value, depending sensitively on the corneal permeability and diffusivity of solutes in tear film.

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