AUTOMATED BRIGHTNESS AND CONTRAST ADJUSTMENT OF COLOR FUNDUS PHOTOGRAPHS FOR THE GRADING OF AGE-RELATED MACULAR DEGENERATION

Purpose: To develop and validate an algorithm to automatically standardize the brightness, contrast and color balance of digital color photographs used to grade Age-related Macular Degeneration (AMD).

Methods: Seven-field color photographs of patients older than 50 years with any stage of AMD and a control group at two study sites were acquired with either the Topcon TRC-50DX (Topcon Medical Systems, Tokyo, Japan) or Zeiss FF-450Plus (Carl Zeiss Meditec, Dublin, CA) cameras. Field 2 photographs, the basis of AMD classification, were analyzed.

Pixel brightness values in the red, green, and blue (RGB) color channels were adjusted in custom-built software to make the mean brightness and contrast of the images equal to optimal values determined by the Age-Related Eye Disease Study (AREDS) 2 group.

Results: We analyzed images of 370 eyes. We found wide variation in the color characteristics of the images at baseline, even for those taken with the same camera. Enhanced transmission of blue light was detected in pseudophakic as compared to phakic patients (p < 0.001). After processing, image brightness variability was reduced by factors of 69, 62, and 96 for the RGB channels, respectively, thus making image brightness values within 0.5 units of the targets.

Variability in contrast was reduced by factors of 6, 8, and 13 for the red, green, and blue channels after adjustment. Before adjustment, 23% images considered non-gradable but after adjustment only 5.7% remained non-gradable.

Conclusions: This automated software enables rapid and accurate standardization of color photographs for AMD grading.