Journal Article Review

VISUALIZATION OF MACULAR PUCKER BY MULTICOLOR SCANNING LASER IMAGING

Muftuoglu IK, Bartsch DU, Barteselli G, Gaber R, Nezgoda J, Freeman WR. Retina 2018; 38: 352-8.

Background and Purpose

Color fundus photography (CFP) has long been used to document, follow, and in some cases diagnose, retinal disease. Advancements in imaging technology such as fluorescein angiography, optical coherence tomography (OCT) and scanning laser ophthalmoscopy have provided essential tools for ophthalmologists. Heidelberg Engineering has enhanced its SPECTRALIS® multi-modal imaging platform by incorporating confocal MultiColor™ imaging (MC) in addition to these technologies. SPECTRALIS with MC module simultaneously captures OCT and a pseudo-color composite of three monochromatic reflectance images, to provide details of retinal structures at different depths. Blue light captures details of superficial retinal structures, while green light is absorbed by hemoglobin, enabling capture of vascular changes. Near-infrared light penetrates through the retina and enables imaging of the retinal pigment epithelium and choroid. Because MC appears to provide good visibility of retinal surface changes, the objective of this study was to quantitatively assess the value of MC and CFP in detecting macular epiretinal membranes (ERM).

Methods

48 eyes of 42 patients were included in the study; CFP and MC images had to be of good quality and captured on the same day to be eligible for inclusion. Because of the confocality of MC imaging, the resultant images might be less affected by cataract as compared to CFP; hence, patients with cataract or severe dry eye were excluded to avoid possible skewing of the assessment towards MC. MC images with prominent lens reflex were also excluded. ERMs were confirmed on clinical examination. On CFP, they were defined as an irregular increased reflection on the inner surface of the retina with striae and/or an opaque and grey membrane. On MC, they appeared as a green-yellow structure with attendant retinal folds. Two physicians scored images based on visibility of the ERM; 0 (invisible), 1 (barely visible) and 2 (clearly visible); a third specialist was consulted in case of disagreement. Quantification of discernible retinal folds was done by the same graders in a 2mm x 2mm region identified by a separate observer in CFP and MC (for the 3 individual monochromatic images and the pseudo-color composite). ERMs, and the retinal thickness at the most prominent surface folds, were determined on OCT. Kappa coefficients were used to assess the intergrader agreement, and paired t - tests or Wilcoxon signed-rank tests were used for normally and non-normally distributed data, respectively. $P < 0.05$ was considered statistically significant.

Discussion

The interobserver agreement was high for CFP, the MC composite image, and its components (Kappa = 0.863; 0.850; 0.773 [infrared]; 0.672 [blue]; 729 [green], respectively, all $P < 0.001$). The improved visualization of ERMs on MC over CFP was indicated by both its higher mean grading score (1.8 ± 0.37 vs. 1.01 ± 0.63, $P < 0.001$) and the higher number of discernible surface folds (6.79 ± 3.32 vs. 2.85 ± 2.81, $P < 0.001$). ERMs were invisible on 4 (8.3%) of the 48 CFP images, whereas none were invisible on MC. The green reflectance component of MC had a higher mean grading score than the near-infrared or blue components (1.73 ± 0.44 vs. 0.85 ± 0.46 and 1.51 ± 0.52, respectively), as well as more discernible surface folds (5.54 ± 2.12 vs. 4.2 ± 2.34 and 1.2 ± 0.9).

Conclusions

This is the first study directly comparing CFP with MC in their ability to visualize ERMs. The authors conclude that ERMs can be better detected using MC imaging and found MC more convenient, since it can be captured on the same device as OCT. The green reflectance image in particular contributed to better visualization of the ERM. Although a previous study reported good ERM detection rates with OCT thickness maps, the extent of the ERM differed from that in OCT B-scans. Both from a clinical standpoint (grading scores) and an analytical standpoint (number of surface folds), the data show that MultiColor is useful as an additional tool to evaluate ERMs since it provides greater detail and more accurate information without masquerading the disease.