Journal Article Review

MultiColor imaging for detection of retinal nerve fiber layer defect in myopic eyes with glaucoma

Based on:

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Background and Purpose

Nerve fiber bundle defects can be visualized with conventional imaging methods, like fundus photography (FP), which can be difficult even for the glaucoma specialist. Tessellated fundus, severe disc tilt, diffuse retinal nerve fiber layer (RNFL) thinning, and/or peripapillary atrophy in myopia can confound a glaucoma diagnosis. This retrospective study investigates the diagnostic performance of MultiColor imaging with the SPECTRALIS® MultiColor Module for detecting RNFL defects in myopic eyes with and without glaucoma.

Methods

A total of 138 Korean patients with myopia (58 control eyes and 92 glaucoma eyes) had complete ophthalmic examinations including autorefraction (RK-F2, Canon medical systems, Tustin, CA, USA), axial length measurement (IOL Master 500, Carl Zeiss Meditec AG, Jena, Germany), disc, fundus, and red-free RNFL photography (Visucam 224, Carl Zeiss Meditec AG, Jena, Germany), as well as spectral-domain optical coherence tomography (SD-OCT) (Cirrus-HD, Carl Zeiss Inc., Dublin, CA, USA) imaging for RNFL and macular ganglion cell analysis. MultiColor imaging (SPECTRALIS, Heidelberg Engineering GmbH, Heidelberg, Germany) was performed by an experienced technician after patients were fully dilated. Final composite MC, blue-reflectance MC (486 nm), green-reflectance MC (518 nm), FP, and red-free RNFL photos were examined by two glaucoma specialists to assess visibility (0 – 3, 3 being excellent) and RNFL defect location. The student t-test was used between MC, FP, and red-free RNFL photo, while analysis of variance (ANOVA) with post-hoc Tuckey was used between the different MC images.

Results

- Blue-reflectance had the best interobserver agreement: blue-reflectance (κ= 0.822), green-reflectance (κ = 0.753), MC composite (κ =0.732), red-free RNFL photo (κ = 0.668), and FP (κ = 0.676).
- Green-reflectance had the best RNFL visibility: green-reflectance (2.89 ± 0.31), blue-reflectance (2.88 ± 0.32), MC composite (2.57 ± 0.63), FP and red-free RNFL photo were not as visible.
- RNFL visibility had similar findings in highly myopic eyes (62/150 eyes): green-reflectance (2.81 ± 0.41), blue-reflectance (2.79 ± 0.42), MC composite (2.33 ± 0.93), red-free RNFL photo (2.18 ± 0.85), and FP (2.08 ± 0.93).
- Green-reflectance had greatest sensitivity for temporal superior RNFL defects: green-reflectance (94.9%), blue-reflectance (93.2%), MC composite (91.5%), red-free RNFL photo (89.1%), and FP (83.1%).
- Green-reflectance had greatest sensitivity for temporal inferior RNFL defects: green-reflectance (100%), MC composite (97.7%), blue-reflectance (97.6%), red-free RNFL photo (90.4%), and FP (86.9%).
- MC composite had greatest specificity for temporal superior RNFL defects: MC composite (93.0%), green-reflectance (91.9%), blue-reflectance (90.7%), FP (84.9%), and red-free RNFL photo (84.3%).
- Blue-reflectance had greatest specificity for temporal inferior RNFL defects: blue-reflectance (94.9%), blue and green-reflectance (91.5%), FP (86.8%), and red-free RNFL photo (85.7%).
- MC imaging qualitatively differentiated the region of RNFL defects from normal better than FP.

Conclusions

Where red-free RNFL photography overcomes limitations in FP, it still has limited usefulness in myopic eyes with tessellated fundus. MultiColor appears to offer more consistent assessment than both FP and red-free RNFL photography, enabling to accurately localize structural RNFL defects. Even though MultiColor is not without limitation, it is a useful diagnostic tool in myopic eyes with proven performance.