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POLARIMETRY OF THE OPTIC NERVE HEAD AND LAMINA CRIBROSA

S.I. Guthrie[1,A], J.M. Bueno[2], M.L. Kisilak[1,B], J.J. Hunter[1,A] and M.C. W. Campbell[1,A]

[A] School of Optometry and Department of Physics, [B] School of Optometry, [1] University of Waterloo, Waterloo, ON, Canada
[2] Laboratorio de Optica, Universidad de Murcia, Murcia, Spain

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Abstract

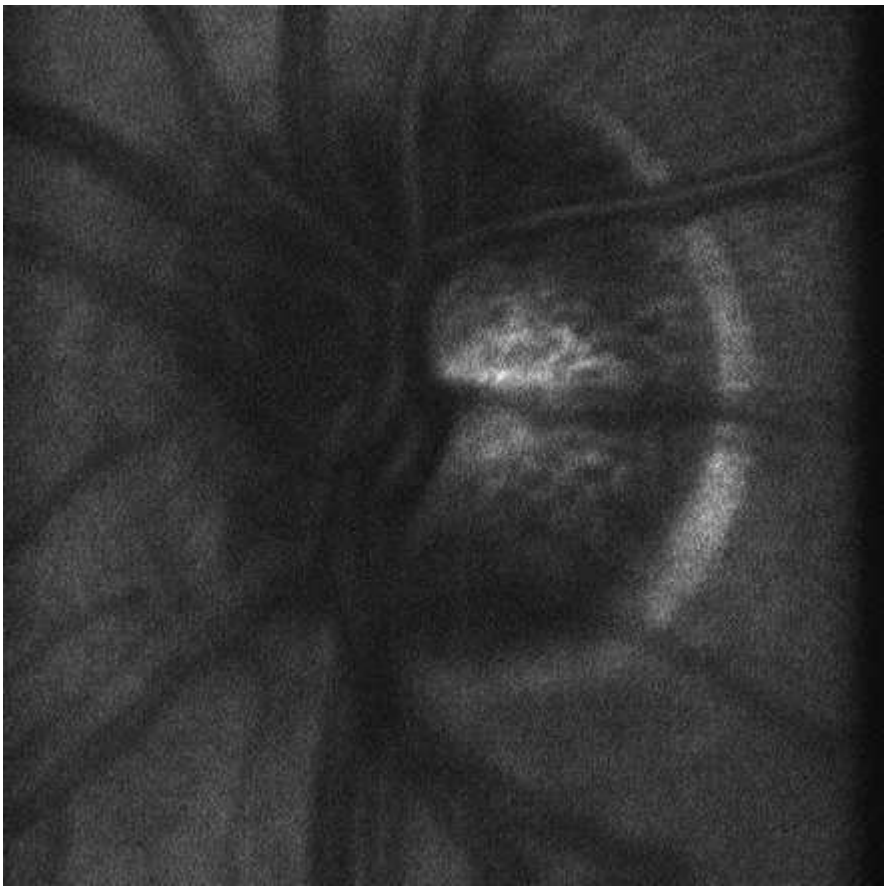
Purpose: We have previously reported improved imaging of retinal blood vessels using polarimetry (Opt. Lett., 27, 830 (2002)). We now wish to apply these methods to resolving features of the optic nerve head (ONH).

Methods: A polarimeter was incorporated into a video–rate He–Ne based confocal scanning laser ophthalmoscope (CSLO) with a 10–degree field of view. Changes in the polarization state of the light were obtained by using a linear polarizer and a quarter wave plate (QWP). By rotating the QWP, four independent polarization states were produced and digital video was recorded. A final control recording was produced with no polarizer or QWP. Average images were calculated using five frames from each video to reduce noise. The laser intensity entering the eye was kept constant for each polarization state.

Results: With the addition of the polarimeter, previously unseen details of the lamina cribrosa extending to the temporal rim of the ONH were clearly observed. These features were resolved preferentially at certain distinct polarization states and were not visible in the control image without the polarimeter or in unpolarized light. Mueller matrix polarimetry further improved the visibility of these features by combining polarization states. These results complement previous reports on the enhancement of retinal blood vessels using CSLO imaging polarimetry. The results are in contrast to recent work on age–related macular degeneration showing an improvement of resolution using depolarized light (IOVS, 44, 4061

(2003)).

Conclusions: Exploiting polarimetry techniqes with the CSLO has allowed us to image ONH features with resolution not previously accomplished. Spatially resolved CSLO polarimetry can provide improved images of a variety of clinically important features that require different light polarizations for optimal imaging.



Keywords: optic disc • imaging methods (CT, FA, ICG, MRI, OCT, RTA, SLO, ultrasound) • optical properties