5th International Congress of Wavefront
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THE CLINICAL UTILITY OF HIGH RESOLUTION IMAGES FROM AN ADAPTIVE OPTICS RETINAL CAMERA

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Disclosure

- Drs. P. Soliz and L.J. Otten are stockholders in Kestrel Corporation
Objective

• To assess the clinical and research value of high resolution retinal images as photographed with an adaptive optics fundus imager.
Motivation

• For the clinic, a high resolution retinal imager must be reliable and easy to maintain and operate
• Significant improvements in image quality must compensate for added costs of an adaptive optics device
• Balance high resolution with informational deluge (avalanche)
• Application is greatest for large field of view (15 – 30°)
Adaptive Optics Fundus Imager

• Field of View is about 20º
• Resolution is ~ 5 μm
• System costs reduced by low element bimorph mirror (18 elements)
• Adaptive optics mirror corrects for low order terms
• Deconvolution is used to correct for high order aberrations
High Resolution Fundus Imager

18 element bi-morph AO mirror
2K by 3K CCD camera
KFG fundus camera
Shack-Hartman & optics
Fiber optic light Feed
Subject S5

• Type I Diabetes Mellitus X 30 years, age 42
• Stable blood sugar
• No other health problems
• Ophthalmologist examination discovered
  • one MA near fovea and
  • small hemorrhage temporal inferior

Subretinal neovascularization
• Not noticed by ophthalmologist
• Not easily visible and not identifiable in standard images

Significance:
• If detection of neovascularization is possible without need for fluorescein angiography, value is obvious
• Retinal neovascularization would re-classify patient to higher risk category (non-proliferative diabetic retinopathy to proliferative)
• Increased need for surveillance
• Vascular pattern strongly suggestive of neovascularization and further evidence that this patient has PDR.

• However, normative micro-vascular pattern not established.

• FA would confirm pathology.
Subject S1a (control)
Subject S1a (control)

• Alternative 1: unusual vessels may be derived from the juxtapapillary choroid

• Alternative 2: Vessels may arise from central retinal artery (non-diabetic) representation may be possible
Summary

• For clinical trials, early detection of retinopathy grade (ETDRS) would reduce study costs (size, duration)
• Each region of interest would boost the ETDRS grade substantially and allow more rapid decision of drug efficacy and/or safety
• Clinically, adaptive optics images appear to provide early detection and give added insight into the state of the disease
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