ABSTRACT TITLE

TITLE: Automated Detection and Location Analysis of Diabetic Cysts in Retinal OCT Images: An Iterative Filtering Approach

PROGRAM # (Final ID)

ABSTRACT FINAL ID: 4901 - D0340

SESSION TYPE: Poster Session

POSTER BOARD # (DOI)

DIGITAL OBJECT IDENTIFIER (DOI): D0340

PRESENTATION START/END

SESSION ABSTRACT START TIME: 11:00 AM
SESSION ABSTRACT END TIME: 12:45 PM

SESSION # (Abbreviation)

SESSION ABBREVIATION: 446

SESSION TITLE: Imaging I, RE
SESSION DAY & DATE: Wednesday, May 8, 2013
SESSION START TIME: 11:00 AM
SESSION END TIME: 12:45 PM
SESSION LOCATION: Exhibit / Poster Hall

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Study Group:

ABSTRACT BODY:

Purpose: To develop an automated system for segmentation of seven layers in the retinal microstructure and detection of diabetic cysts in diabetic macular edema (DME) using OCT images.

Methods: For retinal layer segmentation an iterative de-noising and high pass filtering algorithm was used. Image denoising was performed by a novel method that extracted the principal low frequency components from the Fourier-domain representation using Wiener deconvolution. Next, the denoised images were iteratively high-pass filtered to extract 7 retinal layer boundaries. Finally, an image mask was created from the segmented retina and was superimposed on the negative of the original image. The masked image was global thresholded to detect the cysts. Total cyst area and total area of a convex boundary hull around the cysts were calculated.

Results: The cyst detection was evaluated using 120 Spectralis SD-OCT images in which the DME cysts were manually traced for comparison. The automated measurements of the total area of the cysts and the convex hull around them (convex area) were compared to the manual measurements. The convex hull area correlated significantly ($r=0.63$, $p<0.001$) with the manual measurement, though the automated area measurement did not ($r=0.67$, $p=0.065$). Additionally, automated determination of cyst locations (inner retinal layers, outer retinal layers, or both) was compared to manual annotation. Cysts existing in both inner and outer layers were located with 95% sensitivity and 66% specificity; cysts in the inner layers were located with 96% sensitivity and 70% specificity; and cysts in the outer layers were detected with 77% sensitivity and 62% specificity. Further sub-location analysis resulted in 81% sensitivity and 67% specificity for detecting cysts in the IPL; 96% sensitivity and 70% specificity for detection in the OPL; and 70% sensitivity and 72% specificity for detection in the ONL.

Conclusions: This novel system can detect cyst area as well as cyst location in eyes with DME. These measurements may help characterize patient status and predict prognosis.

Both images; Automated segmentation of retinal layers and diabetic cysts. RFNL (Blue), IPL/GL (Cyan), INL (Red), ONL (Yellow), PIS (Magenta), POS (Black), PE (Green), Cysts (White).

Grant Support: Yes

Support Detail: MMF: Minnesota Medical Foundation

Clinical Trial Registration: No

Other Registry Site:

Registration Number: