

Quantitative Analysis of Capillary Non-Perfusion in Diabetic Retinopathy using Widefield OCT-Angiography

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Abstract

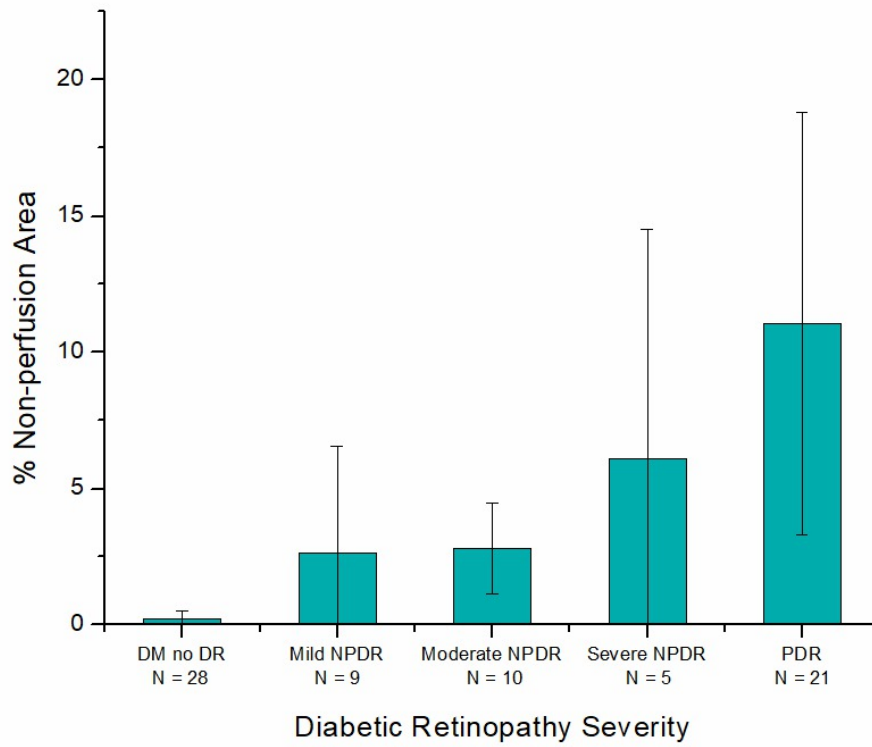
Purpose : Several OCT angiography (OCTA) studies suggest an association between capillary non-perfusion, a surrogate for retinal ischemia, and diabetic retinopathy (DR) severity. However, due to technical limitations, these studies focused on either 3x3mm or 6x6mm fields of view centered on the macula. In contrast, widefield fluorescein angiography (FA) studies suggest that the majority of capillary non-perfusion in early DR occurs outside of the macular region. The recent development of high-speed, widefield OCTA systems, has for the first time allowed non-invasive visualization of retinal vasculature over wider fields of view—a functionality that, in light of previous widefield FA studies, may be promising for early detection and monitoring of DR. This study aims to couple the recent technological advances in high-speed, widefield OCTA with image processing methods to allow for semi-automatic quantitative analysis of capillary non-perfusion of widefield OCTA images of diabetic eyes.

Methods : A semi-automatic, texture-based algorithm that detects areas of non-perfusion on 12x12mm SS-OCTA images from the Zeiss PlexElite™ system was developed. We tested the algorithm on a series of patients with diabetes without DR (28 eyes, 21 subjects; 54.8 ± 10.9 y/o), eyes with non-proliferative DR (NPDR) (24 eyes, 16 subjects; 62.1 ± 13.2 y/o) and eyes with proliferative DR (PDR) (21 eyes, 14 subjects; 52.2 ± 12.7 y/o).

Results : There was a general trend of increasing capillary non-perfusion with increasing DR severity; however, there was significant overlap between patients having different DR severities (Fig. 1).

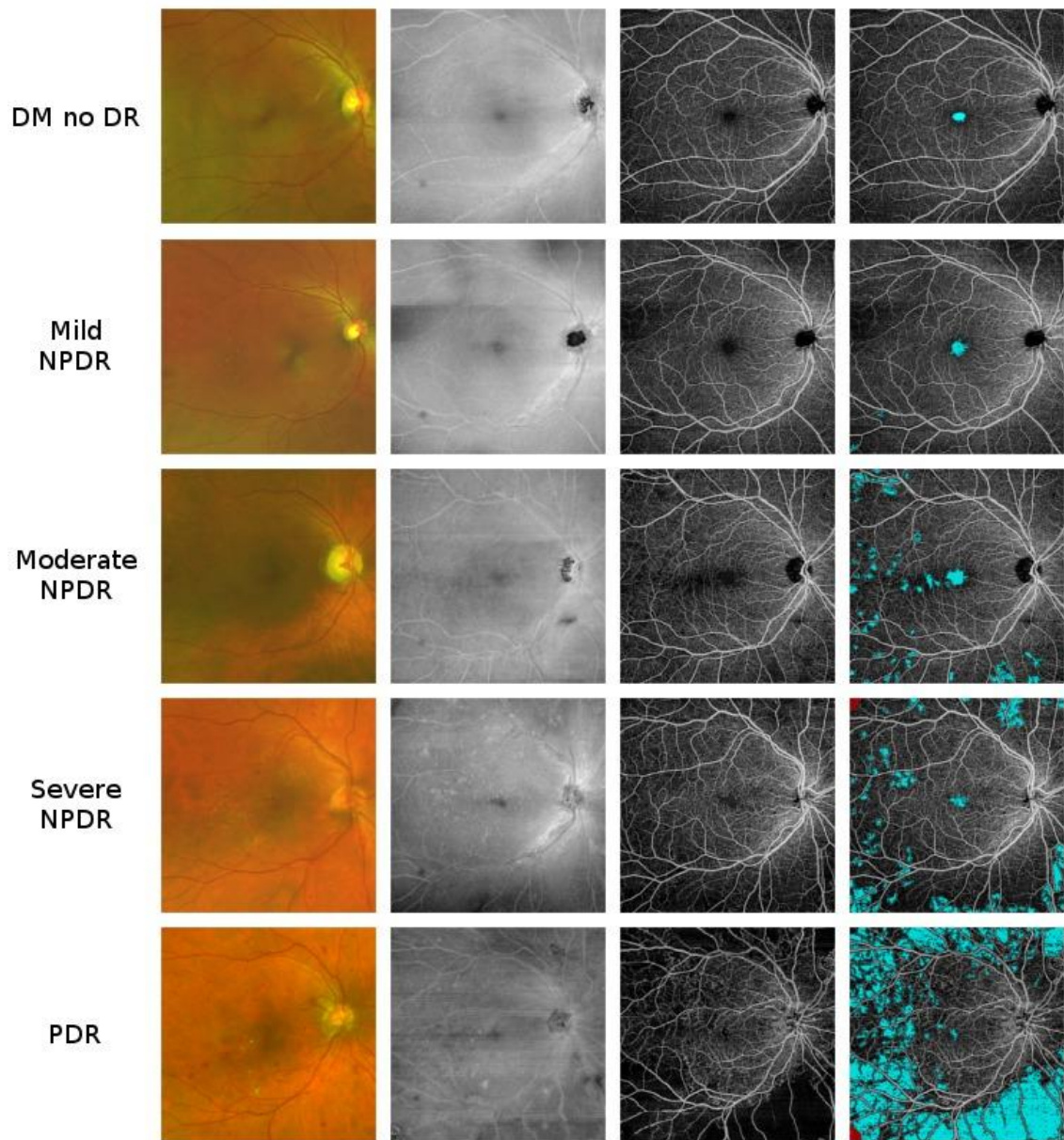
Conclusions : Quantitative analysis of widefield OCTA images may be useful for early detection and monitoring for diabetic retinopathy progression in diabetics. Additional work is needed to determine the added value of widefield OCTA.

This is an abstract that was submitted for the 2018 ARVO Annual Meeting, held in Honolulu, Hawaii, April 29 - May 3, 2018.



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Figure 1. Bar plot of our algorithm's detection of capillary non-perfusion across a range of DR severity evaluated over the entire 12x12mm field of view. Standard deviations bars are shown.



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Figure 2. Representative examples of increasing capillary non-perfusion with increasing DR severity. (L-R) First column: Color fundus image. Second column: Structural en-face OCT. Third Column: Total retinal thickness OCTA projection. Fourth column: OCTA image with the algorithm's results overlaid. Blue corresponds to non-perfusion, red corresponds to manually excluded/deleted areas.