

Novel automated processing technique for standardization and normalization of fluorescein angiography images in patients with uveitis

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Purpose: Fluorescein angiography (FA) is an important diagnostic modality in ocular inflammation and uveitis used to characterize pathology in the retinal vasculature. However, the use of FA is currently limited due to lack of objective quantitative assessment. This study demonstrates the potential of a novel quantitative assessment of FA images using automated processing techniques.

Methods: Patients enrolled in the Uveitis/Intraocular Inflammatory Disease Biobank (iBank) protocol at the National Eye Institute underwent widefield FA using the Optos 200Tx (Optos plc, Dunfermline, United Kingdom). Images were then retrospectively downloaded, removed of patient identifying information, and exported to MATLAB analysis software. The images were subsequently processed using a modified Laplacian of Gaussian (LoG) filter to the extract branch pattern and orientation information, followed by local image intensity normalization and calculation.

Results: Using the methodology described, standardized computer algorithms were successfully developed for a set of digitized fluorescein angiograms. Figure 1 shows a sample image from a patient with uveitis and diffuse vascular leakage. Figure 2 shows the same image after local normalization with the extracted branch pattern overlaid.

Conclusions: Our method of branch pattern extraction provides a way to standardize and extract the vasculature using FA images with a goal of quantifying changes in vascular leakage. This technique can potentially be used to provide a reliable alternative to the current subjective clinician-dependent measurement of vascular leakage or ischemia in uveitis and other diseases with retinal vascular pathology. Additionally, this novel approach can be used to further to investigate whether there are unique phenotypes of branch patterns between healthy controls and patients with uveitis.

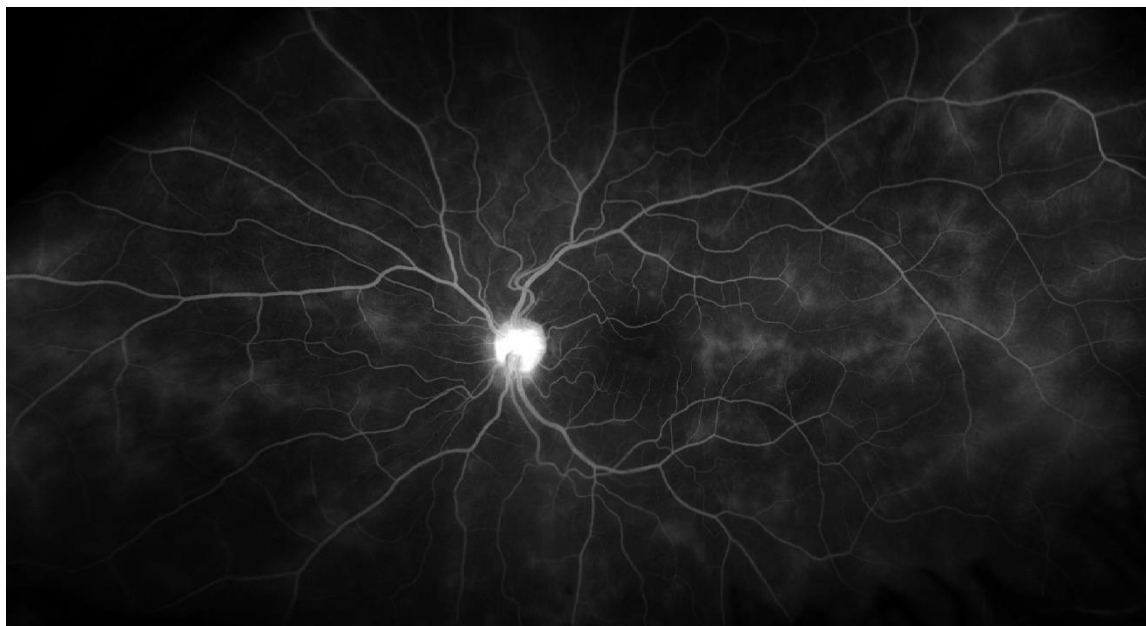


Figure 1: Shows original cropped FA image in a patient with uveitis and vascular leakage

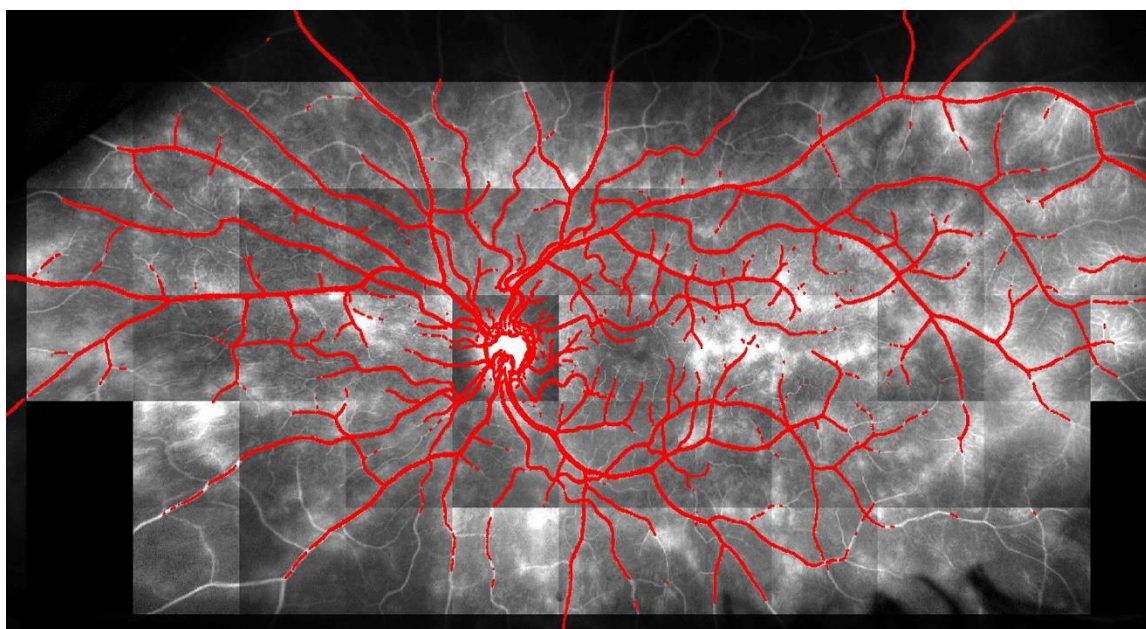


Figure 2 shows the local normalized image with branch pattern overlaid.