

Imaging in uveitis

Citation for published version (APA):

Agarwal, A. (2024). *Imaging in uveitis: use of optical coherence tomography and optical coherence tomography angiography in posterior uveitis*. [Doctoral Thesis, Maastricht University]. Maastricht University. <https://doi.org/10.26481/dis.20240116aa>

Document status and date:

Published: 01/01/2024

DOI:

[10.26481/dis.20240116aa](https://doi.org/10.26481/dis.20240116aa)

Document Version:

Publisher's PDF, also known as Version of record

Please check the document version of this publication:

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Summary

There has been a major thrust across the world in the field of retinochoroidal imaging for diseases related to medical retina and uveitis. In the recent years, there have been numerous advances in technology that have enabled high quality, reproducible and near histological retinochoroidal imaging allowing microscopic assessment of pathological alterations in health and disease. Imaging allows determination of underlying pathophysiological mechanisms of disease, assessment of severity and tissue involvement, differentiation from other close mimickers, and monitoring after therapeutic interventions.

This thesis addresses some of the newer imaging modalities such as optical coherence tomography (OCT) and OCT angiography (OCTA) in the management of uveitis. This thesis analyses newer applications of OCT and OCTA in disease assessment, quantification, and differentiation using objective metrics, adding value to the existing literature.

CHAPTER ONE introduces the anatomy of the uveal tissue and its morphology in healthy eyes, as well as changes occurring in ocular inflammation. The introduction also outlines the aims of the thesis.

CHAPTER TWO provides a review of the various advances in the imaging of uveitis available to clinician-scientists world over in the management of their patients. The chapter discusses applications of imaging tools in infectious and non-infectious uveitis, as well as futuristic applications of technology in disease assessment.

CHAPTER THREE comprehensively reviews the applications of OCT and OCTA in differentiation of various uveitic entities. In this chapter, the utility of OCT and OCTA in distinguishing entities such as Vogt-Koyanagi-Harada's syndrome from central serous chorioretinopathy, acute posterior multifocal placoid pigment epitheliopathy from multiple evanescent white dot syndrome, vitreoretinal lymphoma from infectious retinitis, and tuberculosis from sarcoidosis. These constitute relevant applications of this non-invasive technology in the clinics.

CHAPTER FOUR provides an update on the epidemiology, manifestations, clinical presentation, imaging features and treatment of inflammatory choroidal neovascularization (CNV) that occurs in eyes with long-standing uveitis. The chapter also provides insights into the differences in the CNV related to uveitis versus those that occur in the context of age-related macular degeneration. The

utility of OCT and OCTA in the assessment of inflammatory CNV has been described as well.

CHAPTER FIVE investigated the micro-anatomy of the retinal vasculature in eyes with quiescent posterior uveitis compared to healthy control population. In this study, OCTA was used to assess the superficial and deep retinal vascular plexus in patients and control population. The OCTA was useful in demonstrating the decrease in retinal vessel density in eyes with quiescent uveitis which correlated with the visual acuity in these patients.

CHAPTER SIX evaluated the role of OCT and OCTA in assessing the presence of choroidal neovascularization (CNV) in eyes with punctate inner choroidopathy (PIC) and multifocal choroiditis (MFC). The study categorized eyes as those with CNV and those without and studied the morphological differences on OCT in these two situations. The chapter describes the utility of OCT in determining possible subclinical CNV when OCTA is not available.

CHAPTER SEVEN elaborates a number of thresholding techniques and algorithms for assessing choriocapillaris blood flow in posterior uveitis using OCTA. The systematic review provides a comprehensive review of literature summarizing various metrics such as vessel density, flow deficit area, and other parameters that can be used to determine the severity of choriocapillaris involvement.

CHAPTER EIGHT demonstrates automated technique of choriocapillaris assessment in eyes with tubercular serpiginous-like choroiditis, another common manifestation of posterior uveitis. The study used OCTA images of patients with active disease and performed automated calculations using a predetermined algorithm. Using this approach, OCTA was capable of detecting a higher loss of choriocapillaris in eyes developing paradoxical worsening of tubercular choroiditis compared to eyes that did not develop this complication.

CHAPTER NINE describes a prospective interventional clinical trial that evaluated the utility of OCTA in demonstrating choriocapillaris recovery using two treatment strategies. In one arm, the patients received only standard oral corticosteroid treatment for multifocal choroiditis, whereas in the other arm, oral therapy was supplemented with intravitreal dexamethasone implant. OCTA was useful in detecting higher recovery of flow deficit areas in the arm that received adjunct intravitreal therapy.

In summary, the thesis is focused on novel applications of OCT and OCTA in a wide spectrum of uveitic entities such as disease quantification (in terms of retinal and choroidal vessel density), determination of complications

such as CNV and paradoxical worsening of the disease, recovery of choroidal blood flow after initiation of treatment (using automated OCTA-derived metrics), and distinguishing one disease from another.