



ATLAS LITERATURE REVIEW

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Welcome to the ninth issue of Centre for Eye Health's [ATLAS Literature Review](#). Each quarter we'll be bringing you reviews from our pick of the latest literature as part of your ATLAS subscription.

Delaying treatment in patients with early glaucoma does not result in significantly poorer visual outcomes

Prepared by Henrietta Wang

Clinical applications: With multiple modalities to detect structural signs of glaucoma, many patients with glaucoma are now being identified when they have no or very little associated visual field loss (i.e. early glaucoma). This study aimed to identify whether there was a difference in long-term visual outcomes between treated and treatment-delayed patients with early glaucoma.

Summary: This study utilized data from the Early Manifest Glaucoma Trial. A total of 255 newly diagnosed early glaucoma patients were followed for up to 21 years. Patients were randomized into two groups: (1) immediate treatment, or (2) treatment withheld unless there was evidence of progression. While the rates of vision impairment and blindness were slightly higher in the treated group than the untreated group, the difference between the groups were not statistically significant. The visual field mean deviation and progression rate were higher in the untreated group compared to the treated group but this difference was also not significant. There was no difference in visual acuity between the two groups.

Key findings: These results show that delaying treatment in patients with early glaucoma until there are signs of progression does not result in a significant reduction in functional outcomes. This highlights it is safe to establish progression in patients with early glaucoma prior to treatment initiation.

Reference: Heijl, A., Peters, D., & Bengtsson, B. (2023). Long-term Impact of Immediate Versus Delayed Treatment of Early Glaucoma: Results From the Early Manifest Glaucoma Trial. *American journal of ophthalmology*, 252, 286-294. <https://doi.org/10.1016/j.ajo.2023.04.010>

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OCT Angiography is a valuable imaging technology for the diagnosis and monitoring of diabetic retinopathy

Prepared by Michele Clewett

Clinical applications: Ocular Coherence Tomography Angiography (OCTA) is a non-invasive technology that can help in the assessment of diabetic retinopathy. Whilst this technology cannot detect micro-aneurysms as effectively as fluorescein angiography (FA) or detect vascular leakage, it is more sensitive than fundus imaging and can detect capillary loss before the retinal lesions typical of diabetic retinopathy (DR) become apparent. With this in mind, OCTA promises to be an important imaging technology in the detection of diabetic retinopathy. There are several OCTA metrics of particular import in this area, however challenges associated with imaging and interpretation do exist with this technology.

Summary: The study authors analysed the literature around current and emerging OCTA and deep-learning technologies and algorithms that may facilitate the qualitative and quantitative assessment of DR. They also investigated emerging OCTA technologies that may help to reduce imaging artefacts. Based on their literature review, they have formulated several recommendations relating to the use of OCTA in patients with diabetes.

Key findings: This paper identified several key OCTA metrics that are useful in the assessment of DR. The metrics most useful for practicing optometrists who have access to current OCTA technology include distortion of the Foveal avascular zone (FAZ) (note that FAZ measurements are not available with currently used OCTA technology); the presence of extra-foveal avascular zones, intra-retinal microvascular anomalies (IRMA) and/or neovascularisation. The paper doesn't give any clear guidelines around when OCTA should be performed, but it does illustrate the increasing usefulness of this technology in detecting and managing DR. With this in mind, practitioners without access to OCTA should consider referring high-risk diabetic patients and those with significant signs of ischaemia (eg cotton wool spots, widespread retinal haemorrhage) for OCTA imaging.

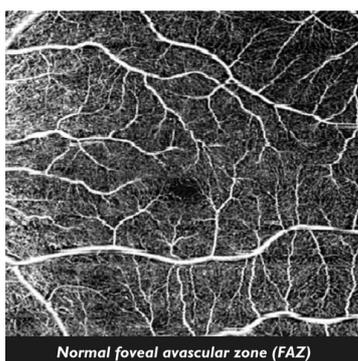
The authors also identified some operating guidelines to help reduce imaging artefacts, and these are valuable for those Optometrists currently using this technology. The guidelines include:

- Using a full-retinal slab OCTA image to minimise segmentation errors and the likelihood of projection artefacts.
- Using well-trained operators to minimise shadow and de-focus artefacts.
- Using wide-field OCTA (although this is currently limited by the available technology which results in a reduced density of data peripherally).

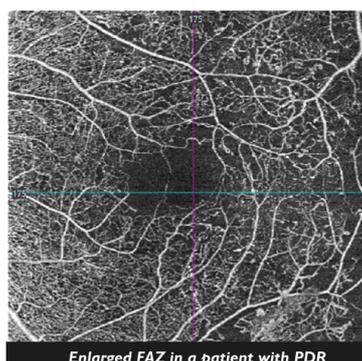
Looking to the future, new deep-learning algorithms which have been shown to assist in differentiating avascular zones from shadow artifacts, and image re-construction technology will help overcome some of the challenges associated with OCTA. Additionally, algorithms that can produce quantitative metrics (eg FAZ, vessel density) have the potential to improve the utility and efficiency of OCTA technology in assessing and monitoring DR. For now, however, there are still some significant limitations in OCTA technology, despite increasing use in practice and the next article we have reviewed will explore this further.

Reference: N.K. Waheed, R.B. Rosen, Y.J. Marion, R. Munk, D. Huang, A. Fawzi, V. Chong, Q.D. Nguyen, Y. Sepah, E. Pearce (2023). Optical coherence tomography angiography in diabetic retinopathy, *Progress in Retinal and Eye Research*, Volume 97, 2023, 101206, ISSN 1350-9462, <https://doi.org/10.1016/j.preteyeres.2023.101206>.

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Normal foveal avascular zone (FAZ)



Enlarged FAZ in a patient with PDR

OCTA images: The first image (control) shows a normal FAZ. Enlargement of the FAZ and capillary drop-out temporal to the macula (an extra-foveal avascular zone) can be seen in the second image.

OCT-Angiography parameters can vary significantly between devices

Prepared by Henrietta Wang

Clinical applications: There has been growing interest in using OCT-Angiography (OCT-A) to diagnose and monitor optic nerve disease. Radial peripapillary capillary density has been identified as a useful parameter to detect disease and predict progression. This study aimed to compare the agreement of RPCD measurements between four different OCT-A devices.

Summary: The RTVue XR Avanti (RTVue), DRI OCT Triton (Triton), Revo NX 130 (Revo), and PLEX Elite 9000 (PlexE) OCT-Angiography devices were evaluated in this study. The study cohorts included healthy subjects, patients with glaucoma and patients with non-glaucomatous optic neuropathies. The radial peripapillary capillary density reported by each of the devices were compared. There was poor correlation between all pairs of device combinations with the Triton-Revo pairing showing the widest discrepancy and the Triton-PlexE showing the least.

Key findings: If monitoring radial peripapillary capillary density longitudinally, the same device should be used to mitigate potential variability in measurements between devices. These results highlight that OCT-Angiography devices cannot be used interchangeably for radial peripapillary capillary density progression analysis.

Reference: Sawaspadungkij M, Apinyawasisuk S, Suwan Y, Aghsaei Fard M, Sahraian A, Jalili J, Chansangpetch S. Disagreement of Radial Peripapillary Capillary Density Among Four Optical Coherence Tomography Angiography Devices. *Transl Vis Sci Technol.* 2023 Aug 1;12(8):7. doi: 10.1167/tvst.12.8.7. PMID: 37555736; PMCID: PMC10424153.

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Incidence and Risk Factors of Second Eye Involvement in Myopic Macular Neovascularization

Prepared by Meri Galoyan

Clinical applications: With predicted increase in global prevalence of myopia, it is important to appropriately equip ourselves to look after patients with pathological myopia. Several studies have been looking at patterns and risks associated with development of vision threatening myopic maculopathy developments. This study aimed to identify key risk factors in unilateral myopic MNV patients that can predict development of myopic MNV in the fellow eye. With knowledge of risk factors, we prognosticate our patients, appropriately counsel them on visual changes and review more closely for early detection of any complications.

Summary: This retrospective study examined 88 patients with high myopia and diagnosed unilateral myopic macular neovascularization (MNV) from a tertiary hospital in the Netherlands. Twenty-four fellow eyes (27%) developed a myopic MNV during the follow-up. Various data points were collected including information of demographics, the degree of myopia (spherical equivalent), axial length, presence of diffuse or patchy chorioretinal atrophy and lacquer cracks.

Key findings: This study showed patients younger than 40 years old had an increased risk of myopic MNV development in the fellow eyes. The presence of lacquer cracks in the fellow eye seemed to increase the risk of myopic MNV, however did not reach statistical significance. Fundus changes, such as diffuse and patchy chorioretinal atrophy in the fellow eye, did not show statistically significant risk of developing myopic MNV in the fellow eye. Hence, younger patients with unilateral myopic MNV should be appropriately counselled and reviewed closely.

Reference: Ravenstijn, M., Klaver, C. C. W., & Yzer, S. (2023). Incidence and Risk Factors of Second Eye Involvement in Myopic Macular Neovascularization. *Ophthalmology. Retina*, S2468-6530(23)00304-4. Advance online publication. <https://doi.org/10.1016/j.oret.2023.06.025>

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Topographic assessment of intraretinal cystoid space and its prognostic values in idiopathic epiretinal membrane

Prepared by Meri Galoyan

Clinical applications: Idiopathic epiretinal membrane (ERM), caused by avascular fibrocellular proliferation on the innermost retinal surface, is a common condition encountered in an optometric practice. The degree of visual impairment is variable, with some patients experiencing no symptoms and others developing irreversible visual loss and metamorphopsia in advanced stages. Hence, it is necessary refer patients for surgical intervention patients in a timely manner, to avoid irreversible vision loss. It has been established that baseline visual acuity as well as some OCT features, including integrity of photoreceptor layers, ectopic inner foveal layer (EIFL) and macula thickness may be good prognostic signs in predicting post-operative visual outcomes. This study assesses intraretinal cystoid spaces (IRC) in the context of epiretinal membranes to understand their prognostic value.

Summary: This retrospective, observational study examined 122 eyes with ERM 6 months after they underwent vitrectomy, ERM removal, ILM peeling and simultaneous cataract surgery. The eyes were divided into three groups based on IRC presence and distribution (no IRC present, IRC present within 3mm and 6 mm from the fovea). Post-operative OCT features as well as best corrected visual acuity (BCVA) were analyzed.

Key findings: The results showed that the existence of IRC itself had no clinical significance, and eyes with IRCs close to the fovea did not show any difference in BCVA and OCT outcomes compared with those without IRC. However, eyes with wide distribution of IRC within 6mm of fovea were associated with poorer visual and anatomical outcomes after the surgery. It was suggested, the wide distribution of IRC may be related to the chronicity and severity of ERM and hence, early treatment may be beneficial before IRC spreads to the peripheral macula.

Reference: Reference: Kwon, H. J., Kang, M. S., Park, S. W., & Byon, I. (2023). Topographic assessment of intraretinal cystoid space and its prognostic values in idiopathic epiretinal membrane. *Retina (Philadelphia, Pa.)*, 43(8), 1321-1330. <https://doi.org/10.1097/IAE.0000000000003819>

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We appreciate any feedback you may have about our educational resources, particularly the CFEH Atlas. This resource will undergo continuous review and improvement and more cases will be added over time. If you have any feedback or suggestions, we would love to hear them! Please send us an email: education@cfeh.com.au.