



ATLAS LITERATURE REVIEW

Issue 8 • Winter 2023



Welcome to the eighth 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.

Peripapillary choroidal microvasculature dropout is predictive of structural but not functional outcomes in optic neuritis

Prepared by Henrietta Wang

Clinical applications: Optical coherence tomography angiography (OCT-A) is an emerging technology in the diagnosis and management of optic nerve head disease. OCT-A provides a non-invasive method for visualising peripapillary microvasculature changes. Previous work has shown the peripapillary flow index is altered in optic neuritis. This study aimed to assess whether choroidal microvasculature dropout on OCT-A was predictive of retinal nerve fibre layer (RNFL) and ganglion cell-inner plexiform layer (GC-IPL) thickness in patients with optic neuritis.

Summary: This study followed 48 eyes with optic neuritis over a six month period. Eyes were divided into two groups: (1) those with peripapillary choroidal microvasculature dropout, and (2) those without peripapillary choroidal microvasculature dropout. OCT and fields were performed at the 1, 3 and 6 month visits. Logistic regression analyses were used to identify structural and functional factors associated with the presence of peripapillary choroidal microvasculature dropout. While eyes with peripapillary choroidal vasculature dropout had thinner GC-IPL thicknesses at 6 months compared to eyes without dropout, there was no difference the severity of functional loss.

Key findings: Although the presence of peripapillary choroidal vasculature dropout on OCT-A in optic neuritis is structurally prognostic, it is not predictive of the extent of functional deterioration at the 6-months mark.

Reference: Lee, J. S., Park, S., Kim, S. S., Kim, C. Y., Choi, W., Lee, S. Y., & Bae, H. W. (2023). Peripapillary choroidal microvasculature dropout is associated with poor prognosis in optic neuritis. *PloS one*, 18(4), e0285017.

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Prognostic risk factors for the development of proliferative diabetic retinopathy identified

Prepared by Michele Clewett

Clinical applications: Proliferative diabetic retinopathy (PDR) is a sight-threatening complication of diabetes, with retinal ischaemia believed to be the catalyst for development of new blood vessels either at the optic disc (NVD) or elsewhere in the retina (NVE). This study identifies prognostic risk factors to help guide management of patients with diabetes, and where possible, reduce their risk of developing PDR.

Summary: 59 unique studies were included in this Cochrane review, including prospective, retrospective and case-controlled longitudinal studies. The studies investigated potential risk factors for the development of PDR, with study cohorts including a wide range of ethnicities, geographical locations, and socioeconomic status. Prognostic factors considered included patient demographics, clinical data (eg BMI, co-morbidities, triglyceride levels etc) and functional and structural retinal biomarkers.

Key findings: This Cochrane review found evidence that elevated glycated haemoglobin (HbA1c) and more severe diabetic retinopathy at baseline are independent risk factors for the development of proliferative diabetic retinopathy in people with type 1 or type 2 diabetes. The findings also suggest that in people with type 1 diabetes, that the presence of kidney disease, a younger age of diagnosis, higher triglyceride levels and a larger diameter of the retinal veins may all increase the risk of proliferative diabetic retinopathy. In people with type 2 diabetes, the only additional risk factor identified was the presence of kidney disease. These results indicate that patients with type 1 or type 2 diabetes can minimise their risk of developing proliferative diabetic retinopathy (PDR) by maintaining good control of their blood glucose levels throughout their life, and those with type 1 diabetes should additionally maintain normal triglyceride levels to minimise the risk of conversion to PDR.

Reference: Perais J, Agarwal R, Evans JR, Loveman E, Colquitt JL, Owens D, Hogg RE, Lawrenson JG, Takwoingi Y, Lois N. Prognostic factors for the development and progression of proliferative diabetic retinopathy in people with diabetic retinopathy. Cochrane Database of Systematic Reviews 2023, Issue 2. Art. No.: CD013775. DOI: 10.1002/14651858.CD013775.pub2.

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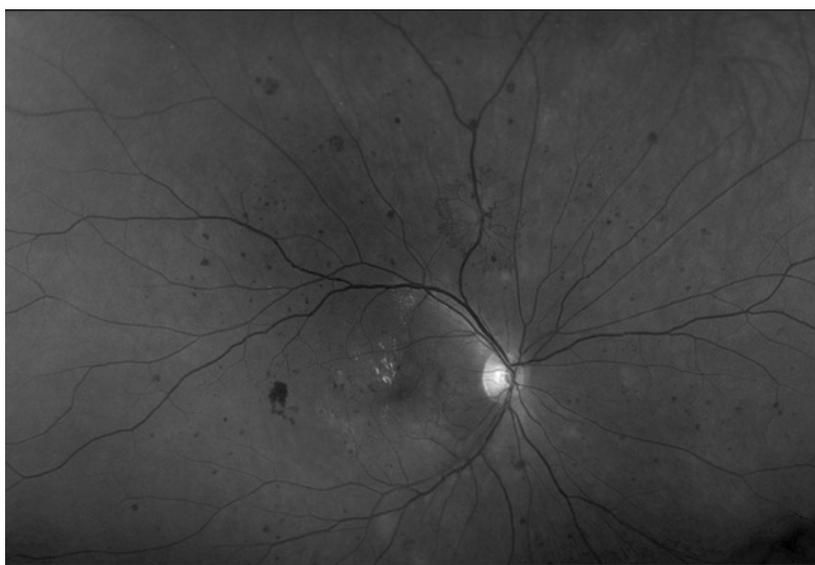


Figure 1: Optomap green-free image of a patient with PDR. Note the pre-retinal haemorrhage temporal to the macula, and area of neovascularisation in a "sea fan" configuration superior to the optic disc.

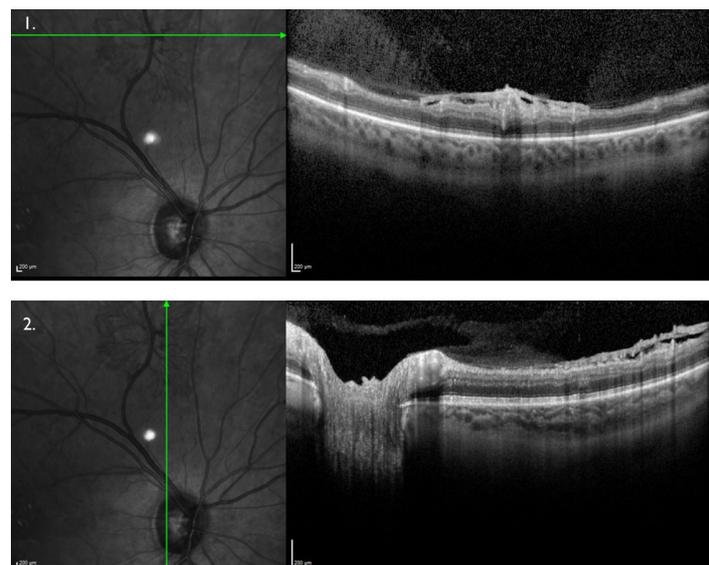


Figure 2: Spectralis OCT line scans (horizontal and vertical) through the area of "sea fan" neovascularisation. The scans clearly show the neovascular membrane located above the retinal surface at the posterior hyaloid of the vitreous. The fibrovascular material is highly reflective.

Use of Optical Coherence Tomography (OCT) in detecting retinal tears in acute, symptomatic posterior vitreous detachment (PVD)

Prepared by Meri Galoyan

Clinical applications: Examining patients with symptomatic acute PVD can be challenging. The presenting symptoms of photopsia or new onset floaters are commonly seen in patients with peripheral retinal tears and breaks. Peripheral retinal tears may occur as a secondary complication from PVD in up to 20-15% of patients. Newer technologies, such as OCT can be useful in identifying the posterior hyaloid membrane and confirming PVD. Studies have also suggested identifying posterior vitreous opacities (PVOs) on OCT can be a useful marker for retinal tears and breaks (Figure 1). These likely represent RPE liberated cells liberated from retinal tear or possible erythrocytes from vitreous haemorrhages.

Summary: This retrospective study examined records of 388 patients who had acute, symptomatic PVD. 90 of these were found to have a retinal tear on dilated fundus examination. This study compared fundoscopic findings as well as imaging characteristics between those with and without peripheral retinal pathology. Fundus examination signs that were predictors of a retinal tear included presence of Shafer sign, vitreous haemorrhage and retinal haemorrhage. With assessment and analysis of OCT scans, there was an additional significant relationship found between PVOs and retinal tears ($p < 0.01$). The sensitivity and specificity of PVOs in detecting tears were 86.7% and 72.5% respectively. Overall, large multicentre, prospective studies may be needed to further corroborate these findings.

Key findings: This study showed that 86.7% of patients with retinal tears presented with PVOs detected on OCT imaging. If available, performing OCT for patients presenting with symptoms suspicious of acute PVD can be helpful not only in confirming vitreous attachment/detachment, but also in identifying PVOs. The results of the study highlight the presence of PVOs is a sensitive marker of a retinal tear. Clinicians may consider reexamining patients for retinal tears in the setting of acute, symptomatic PVD, if PVOs are detected on OCT.

Reference: Rao AV, Shah AR, Nguyen VT, Pearce W, Wong TP, Brown DM, Wykoff CC, Patel SB. Use of Optical Coherence Tomography in detecting retinal tears in acute, symptomatic posterior vitreous detachment. *Retina*. 2023 May 1;43(5):802-807. doi: 10.1097/IAE.0000000000003718. PMID: 36728866.

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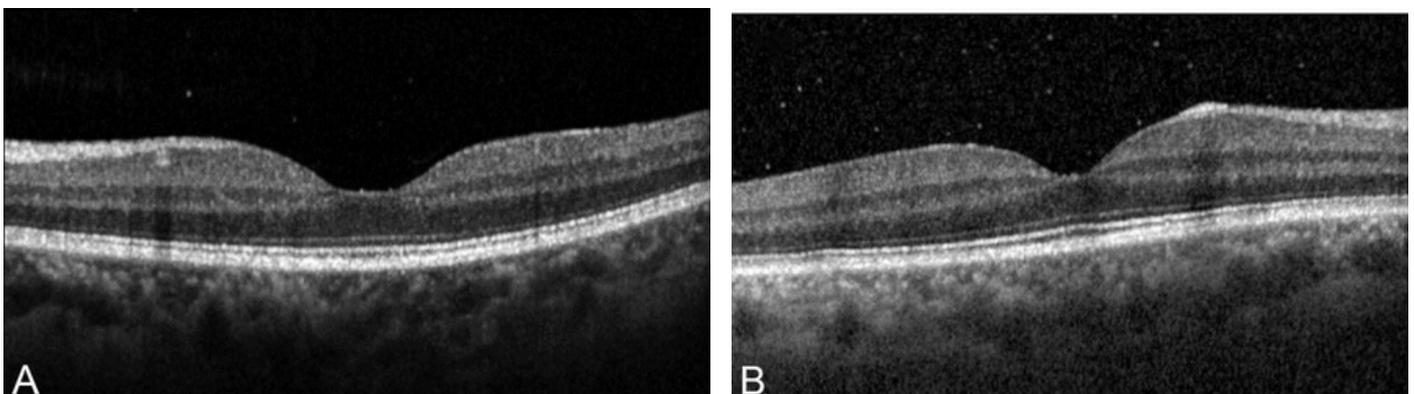


Figure 3: Spectral domain optical coherence tomography demonstrating few (A) and many (B) posterior vitreous opacities in acute PVD associated with retinal tear.

Acupuncture may have beneficial effects in non-neovascular age-related macular degeneration - however the quality of evidence is low

Prepared by Meri Galoyan

Clinical applications: Acupuncture, a traditional Chinese medicine practice involving insertion of thin needles in various body parts, has been historically used for number of eye conditions, including AMD. While anecdotal evidence from patients and small studies have shown possible benefits in receiving acupuncture treatments, there has been no systematic reviews done. It is hypothesized that acupuncture improves microcirculation in the macular area by expanding the surrounding blood vessels after acting on the peripheral area of the eyes. Some studies have suggested that this can promote absorption of exudates and reduce serum VEGF levels in patients with neovascular AMD. Acupuncture treatment of AMD mostly uses a combination of periocular and systemic acupuncture points. This paper provides a systematic review and meta-analysis of randomized controlled trials published in the literature until September 2022. It assists in providing evidence-based responses and clinical practice for enquiring patients.

Summary: This paper assessed a total of 226 articles, and 9 randomized controlled trial studies met the inclusion criteria. There are 508 AMD patients with 631 eyes included in the analysis. The results suggested that compared with the conventional treatment, acupuncture treatment increases the clinical efficacy and visual acuity of patients with AMD. Subgroup analysis of neovascular AMD did not show any improvement in best corrected visual acuity. However, the assessment revealed "low" - "very low" quality of evidence mainly due to high heterogeneity, potential performance bias and large number of patients lost to follow-up.

Key findings: While there may be some promising results with acupuncture in patients with non-neovascular AMD, these results must be viewed with caution as the evidence is minimal at this stage, and this caveat should be acknowledged to interested patients.

Reference: Sun W, Zhao Y, Liao L, Wang X, Wei Q, Chao G, Zhou J. Effects of acupuncture on age-related macular degeneration: A systematic review and meta-analysis of randomized controlled trials. PLoS One. 2023 Mar 23;18(3):e0283375. doi: 10.1371/journal.pone.0283375. PMID: 36952520; PMCID: PMC10035922.

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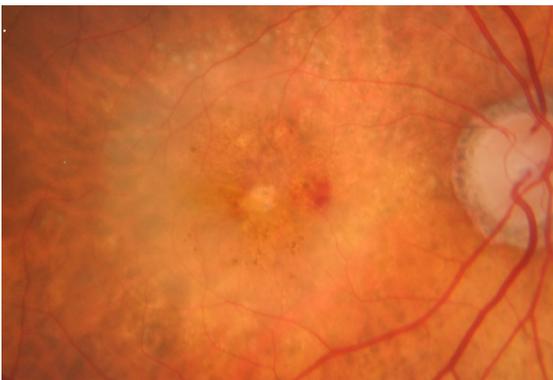


Figure 4: Fundus photograph of a patient with neovascular AMD.

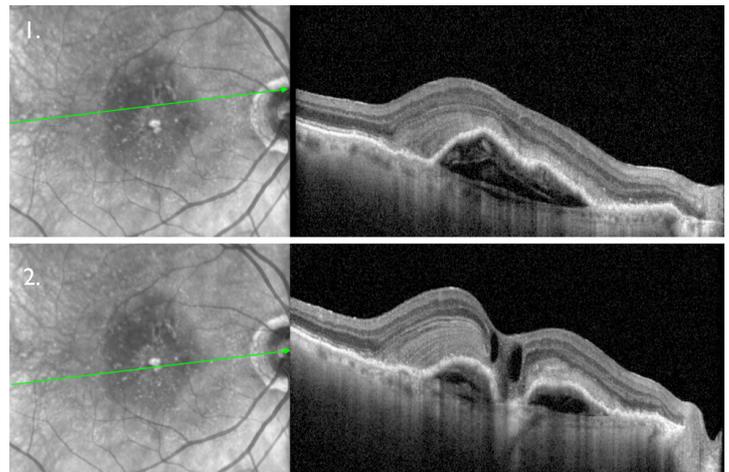


Figure 5: OCT line scans through the macula of the same patient showing a pigment epithelial detachment with mixed internal reflectivity and intra-retinal fluid. This appearance is strongly suggestive of the presence of choroidal neovascularisation.

Pressure-based phenotypes of glaucoma are not structurally or functionally differentiable

Prepared by Henrietta Wang

Clinical applications: In addition to guiding treatment targets and projecting disease trajectory, intraocular pressure in glaucoma has also been used to predict the location of functional loss. Several studies have found low-tension glaucoma (IOP \leq 21mmHg) to be associated with more focal, central functional loss and high tension glaucoma (IOP $>$ 21mmHg) with more diffuse, peripheral functional loss, although this generalisation is somewhat equivocal in the literature. This study aimed to determine whether there was a quantifiable difference in the structural and/or functional clinical parameters that might differentiate high- and low-tension phenotypes of glaucoma.

Summary: This study compared two visual field test results done on the same eye and the same day from over 2800 eyes of patients seen within the CFEH clinic. The two field results were compared to assess whether results with more gaze tracking 'movement' correlated to a different outcome. Gaze tracker data was broken down into: (1) total number of ticks (deviations), (2) sum of amplitudes (total extent of deviation), and (3) average amplitude (average deviation during testing). Visual field parameters such as mean deviation and event analysis were analysed as well as other metrics used to assess visual field reliability.

Key findings: There was no quantifiable difference in either structural or functional parameters that can be used to differentiate between the pressure-based phenotypes of glaucoma. This highlights the diversity of clinical presentations within pressure-based phenotypes groups of primary open angle glaucoma.

Reference: Rafla, D., Khuu, S. K., Kashyap, S., Kalloniatis, M., & Phu, J. (2023). Visualising structural and functional characteristics distinguishing between newly diagnosed high-tension and low-tension glaucoma patients. *Ophthalmic & physiological optics : the journal of the British College of Ophthalmic Opticians (Optometrists)*, 10.1111/opo.13129. Advance online publication. <https://doi.org/10.1111/opo.13129>

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