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COVID-19 and retinal OCT: an Australian case study

Abstract

The following presents a primary care optometry encounter with a patient who has recovered from COVID-19. This article aims to highlight the potential for optometry to contribute to a better understanding of the visual and retinal manifestations of patients diagnosed with COVID-19.

Keywords

retinal, covid-19, study, case, australian, oct:

Publication Details

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COVID19 and retinal OCT in Australia: a case study

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Keywords: COVID19, OCT, retina, Ganglion Cell Layer, inner plexiform layers, Visual field analysis, neuro-ophthalmology and optometry.

Abstract:

Healthy 31-year-old COVID19 survivor, Mrs CV, presented for routine eye examination in Brisbane Australia.

Mild hyper reflective lesions at the level of the ganglion cell and inner plexiform layers in both eyes were detected, and slight vascular distension of the inferior vascular arcades observed in the LE with optical coherence tomography (OCT), as well as slight central visual field defect in the right eye. In isolation both these subclinical observations are important, but together they point to further research required specifically in the area of the form and function of the papillomacular bundle and the way it responds to neuro invasive viral infection.

Still the absence of cotton wool spots and the absence of micro-haemorrhages means that there is not sufficient evidence of retinopathy and she remains subclinical with further review examinations pending.

This primary care optometry encounter with a patient who has recovered from COVID19 highlights the current gaps in knowledge, as well as the importance of peer reviewed correspondence, and finally a principled approach to the provision of safe and effective health care.

Introduction

Coronaviridae affect different parts of the body including the nervous system and ocular tissues.(1) Further, coronaviridae are often highly contagious.(2) Since SARS-CoV-2 first began spreading in Wuhan, has been a particular challenge when diagnosing, containing and treating the novel coronavirus COVID19. (3)

Infection control and PPE use has been an important part of clinical competence in order to safely examine patients for some time.(4) The use of PPE has become more pertinent recently since the COVID19 outbreak (5) but has long been a part of primary eye care; for example when treating epidemic keratoconjunctivitis adenovirus.(6) Ocular tropism of viruses means that contact with ocular tissues can be a mode of transmission.(7) Virus particles can infect the ocular surface and later spread to develop systemic symptoms.(8) This requires that goggles, gloves and gown be worn by a health carer, and, strict hygiene procedures and infection control measures be put in place for those working with a person with active COVID19 infection.(9)

Despite this Australia, with our early contact with COVID19 cases and yet relatively low COVID19 case load, has been able to focus on containing outbreaks of community transmission, developing safe and effective treatments and vaccine trials, and now; providing vigilant health care to the survivors of COVID19. (10)

Primary eye care has ongoing contact with patients,(11) some may be asymptomatic, or pre symptomatic and otherwise undiagnosed, and others that have recovered from COVID19.(12) A comprehensive eye examination requires close contact which can put both clinician and patient at risk.(13) Practicing optometrists should have an adequate understanding of COVID safe practice and the potential for clinically significant and subclinical retinal change in COVID19 survivors.

Recent Lancet correspondence reported retinal changes in a group of adults with symptomatic COVID19 infection. (14) All twelve had fever, asthenia, and dyspnoea and 11 out of twelve also presented with anosmia. All twelve showed hyper-reflective lesions at the level of the ganglion cell layer and inner plexiform layers that were most prominent in the papillomacular

bundle in both eyes.(14) Four of these patients showed subtle cotton wool spots and micro haemorrhages in the retinal arcades. Visual acuity and pupil reflexes were normal for this group and there were no visual field test results published. Marinho et al contend that ganglion cell and plexiform layer changes could be associated with CNS manifestations that have also been described in animal studies (15) and in COVID19 related neurological events(16). Australian eye care professionals are well placed to begin to answer the questions that this peer review correspondence raises.(17)

Case study

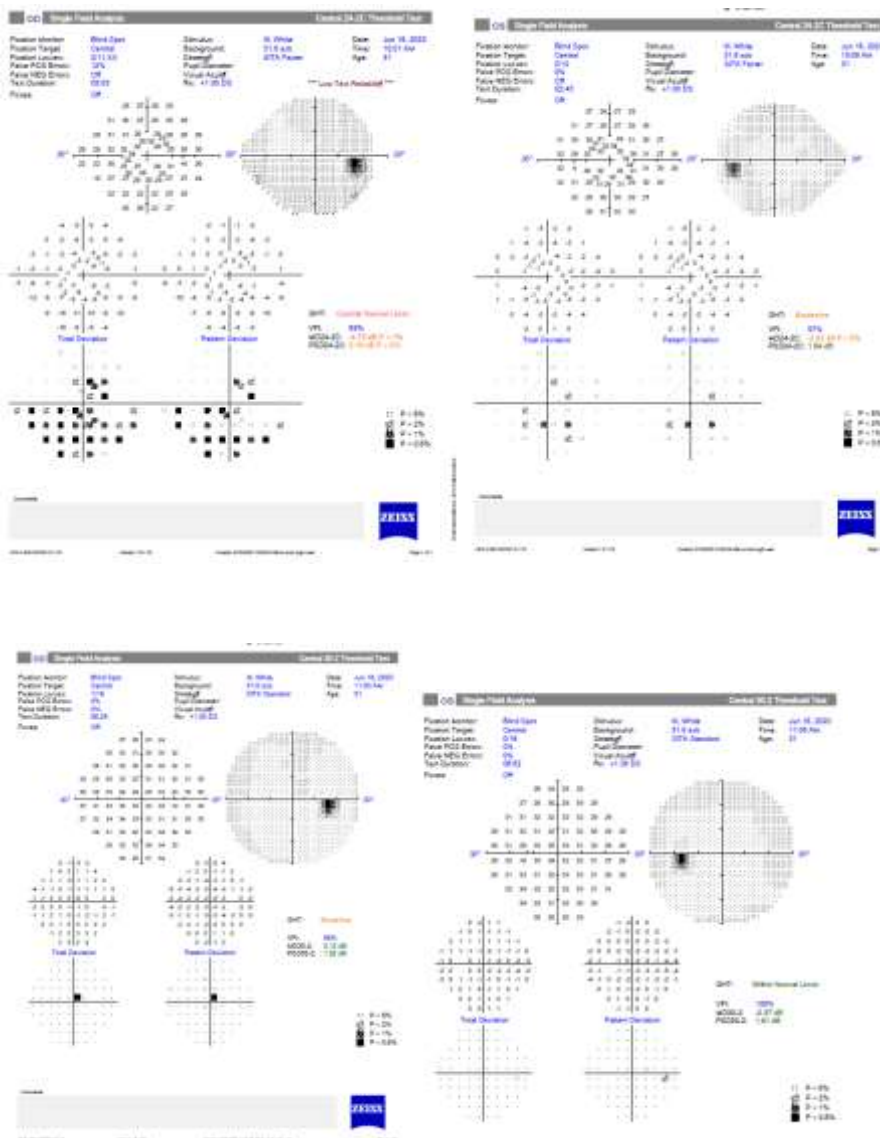
Case study involves OCT and VF assessment of a 31 yo female, Mrs CV who reported testing positive to COVID19 in March after flying to Brisbane from London 12 weeks ago. She did have some anosmia at the time, which also reduced her sense of taste at the time. She reported no vision changes, no hearing or balance changes, no skin sensation changes on the face or body, no blink disturbances, no speech or swallowing problems and was able to exercise rigorously on her treadmill throughout the COVID19 infection. MrsCV generously consented to this case study.

She had slightly reduced unaided vision RE 6/6 compared to LE 6/5, with no improvement with PH or refraction. No symptoms or signs of intraocular inflammation detected. BV was normal. Stereopsis normal. She reported slight colour difference with the RE duller than the LE but still passed all Ishihara slides without errors for each eye. Amsler grid was stable and given for home monitoring. Pupillary reflexes were normal. [see report]. Wide view retinal scan and corneal topography results were normal R&L.

OCT scans and fundus photography were largely normal with no cotton wool spots and microhaemorrhages observed. [see results] Mild hyper-reflective lesions at the level of ganglion cell and inner plexiform layers in both eyes were found. [see Topcon report] These were mild in comparison to the hyper-reflective lesions described by Marinho et al. There was some asymmetry noted in the prominence of the inferior vascular arcades with the L side thicker than the R side. Both of these signs are so slight as to be in the order of magnitude of a possible artefact. Repeat OCT (as per Marinho et al) with another OCT instrument found similar subclinical results.[see Canon reports]

Humphries VF test is an important test to help link changes in retinal form with visual function. Mrs CV has completed a 24-2 Sita fast R&L and 30-2 Standard test R&L. The first 24-2 test was unreliable, RE was ONL. Repeat 30-2 standard VF test confirmed only a small central upper temporal quadrant relative VF change which significantly may be associated with mild dysfunction of the inferior papillomacular GCL bundle. [see VF reports]

Mrs CV is being monitored monthly to determine if these lesions will spontaneously resolve, and retinal thickness of the inferior arcades return to normal and central VF test results stabilise. (18)



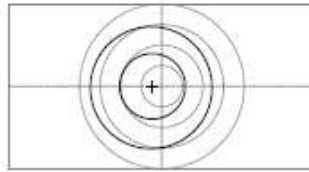
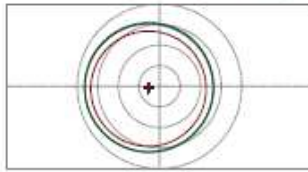
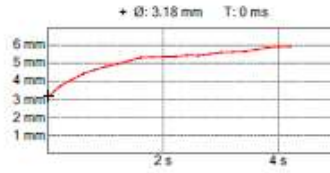
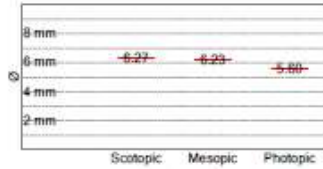
[Figure below: Pupils are equal and round and responsive.]

Acquisition date: 16/06/2020 10:21:58 [#1-1]

OD

Scotopic (0.04 lux): -0.51 mm, -0.05 mm, 6.27 mm
 Mesopic (4 lux): -0.51 mm, -0.08 mm, 6.23 mm
 Photopic (40 lux): -0.54 mm, -0.12 mm, 5.60 mm

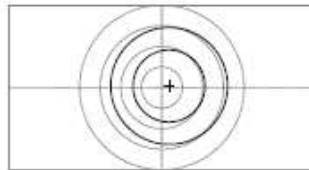
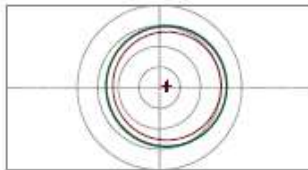
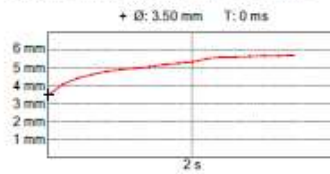
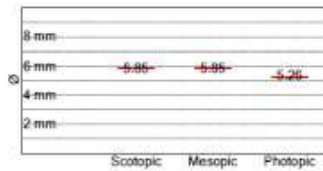
Dynamic:
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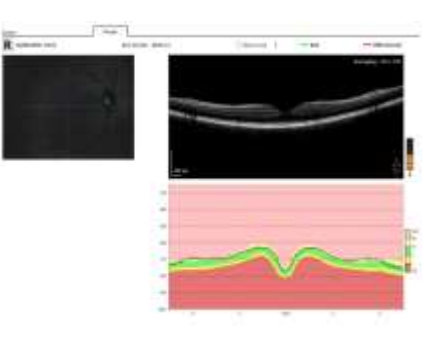
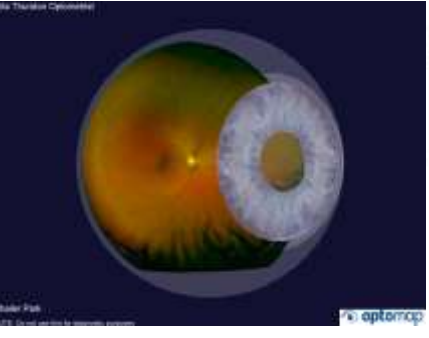
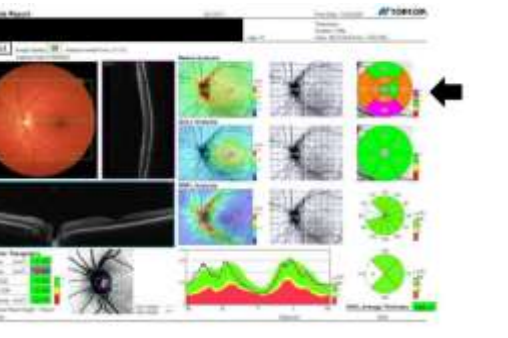
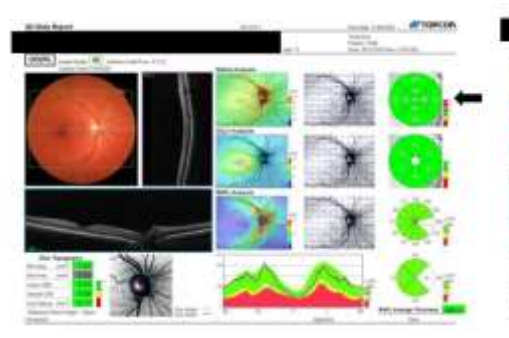
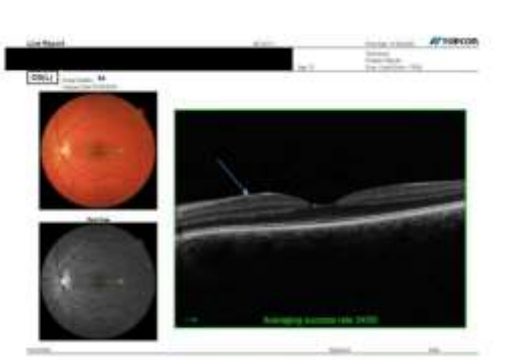
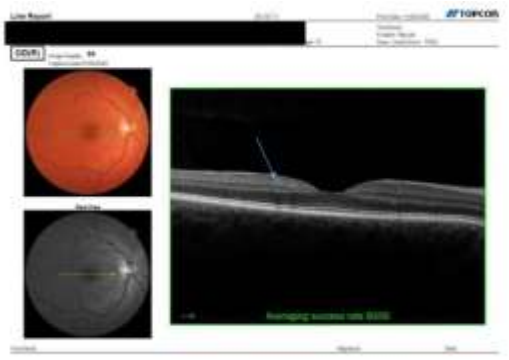
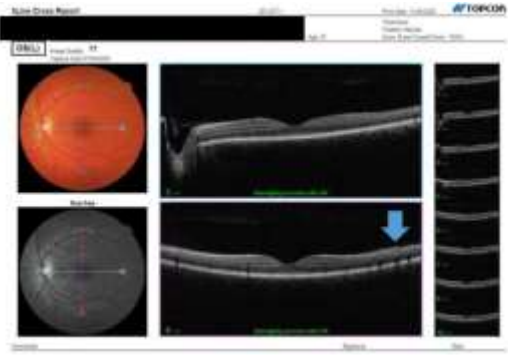


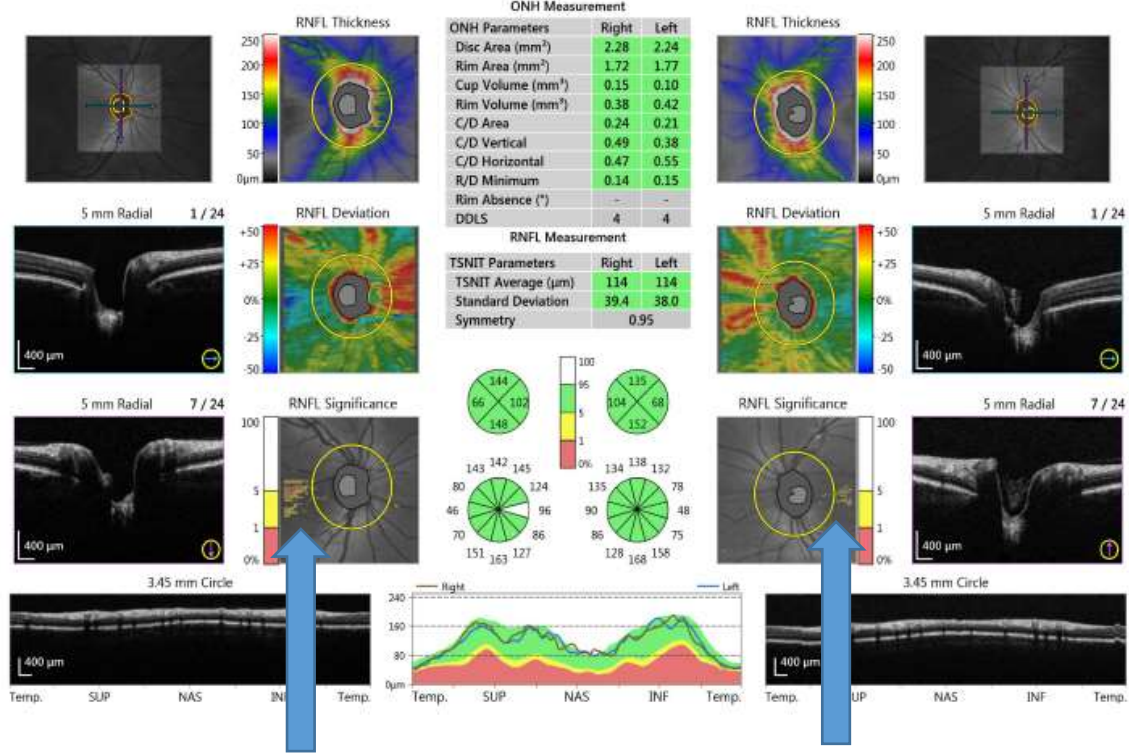
OS

Scotopic (0.04 lux): 0.32 mm, 0.05 mm, 5.85 mm
 Mesopic (4 lux): 0.35 mm, 0.08 mm, 5.85 mm
 Photopic (40 lux): 0.36 mm, 0.08 mm, 5.28 mm

Dynamic:
 $\emptyset(D)$: xc = 0.35 mm yc = 0.08 mm \emptyset = 3.50 mm
 $\emptyset(N)$: xc = 0.35 mm yc = 0.08 mm \emptyset = 5.68 mm







Conclusions.

The neurologic manifestations of severe respiratory viral contagions have been understood for some time.(19) There has been some published ongoing research into the potential for CNS damage from corona virus and similar infection. (18) (20) Importantly SARS Co-V-2 showed potential as a highly neuroinvasive and neurotropic pathogen and at the very least has shown to be during acute stage of the disease in humans to date.(5)

OCT has become an important diagnostic tool with a range of retinal conditions. Some sight threatening retinal change is linked to systemic disease, such as diabetes, or even demyelinating neurological conditions such as MS. PreCOVID19 there has been a great deal of literature discussing the significance of non-sight-threatening OCT changes and early detection of changes in populations with Alzheimer's and cognitive decline.(21) The elderly are particularly prone to glaucoma and this has been a confounding factor in the construction of a definitive OCT screener for Alzheimer's.(22)

To date published ocular manifestations have focused on oculartropism and viral conjunctivitis which are both important with ensuring COVID safe practice.(8) But recently published clinical observations have returned the focus to subtle retinal changes.(9) Even though non sight threatening, if these novel retinal clinical findings are confirmed within various surviving COVID19 populations, there are important implications for safety and efficacy of current cohort of COVID19 vaccinations and the general epidemiological management of COVID19. Until clearly defined, the precautionary principle is important to consider with respect to policy provision. Further, principles of safety and effectivity, encompassing the opposing problems of under-diagnosis and over diagnosis, are key to informing evolving post COVID19 professional clinical judgment and practice.

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