Capturing the occult central retinal artery occlusion using optical coherence tomography.

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Introduction

Central retinal artery occlusion (CRAO) is an ophthalmic emergency. Occlusion of the central retinal artery results in hypoperfusion of the inner retina, leading to rapid cellular damage and ultimately vision loss which is often enduring.[1]

Animal models have shown that irreversible damage occurs at 105 minutes of occlusion, highlighting the importance of early detection and management.[2 3]

Macular oedema and 'cherry red spot' are the established ophthalmic signs used to diagnose CRAO, however examination of the fundus may be normal early in the course of the disease.

Imaging diagnostic techniques include spectral-domain optical coherence tomography (OCT). OCT is not routinely performed in the work-up of retinal artery occlusion (RAO) and its role is still evolving.

OCT findings of impending or occult CRAO without cherry red spot have not been well described in the literature. In this study, all patients that were initially given a diagnosis other than CRAO had their OCTs reviewed for evidence of inner retinal ischaemia.

These cases may help to provide a window into the earlier detection of CRAO and therefore potential for intervention if effective treatments are developed in the future.

A delayed diagnosis of CRAO can have devastating consequences

Methodology

This was a retrospective case series review conducted at the large tertiary unit of Moorfields Eye Hospital NHS Trust from June 2017 to June 2020. This study was registered and approved locally and followed the Helsinki declaration.

Patients were identified from the hospital's electronic medical records system. Patients with a diagnosis of CRAO were identified who had at least one visit to the eye casualty prior to clinic diagnosis and then a subsequent follow-up in the hospital's eye clinics.

All patients had a full ophthalmic work-up including exclusion of alternative diagnoses such as giant cell arteritis (GCA) on the basis of clinical examination and labs.

Patients who were correctly diagnosed with CRAO on their initial casualty visit were excluded. All patients had been seen by a minimum grade of a fellow or third year senior resident ophthalmologist with the presenting fundus findings not having any features of CRAO.

OCT images were captured on a DRI Triton (Topcon, Tokyo, Japan) and Heidelberg Spectralis (Heidelberg Engineering, Heidelberg, Germany).

Results

From the 214 patients identified, 11 patients (5.14%) between the ages of 20 to 84 years had been given an alternative initial diagnosis at their first presentation in casualty but then were subsequently correctly diagnosed with CRAO.

Representative patient 1 is described. OCT images for patient 2, 5-10 are included in Figure 2.

OCT evidence of inner retinal ischaemia is often apparent in occult CRAO

Patient 1

- 71-year old man with sudden painless loss of vision in the right eye several hours earlier presented to the eye casualty.
- Fundal examination was unremarkable with no RAPD and OCT on presentation was reported as normal (figure 1).
- Platelets, erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) were not elevated. His visual acuity (VA) was 2/60 at presentation and he was asked to return the following day for visual field testing.
- Overnight his vision further deteriorated and on attending for visual field testing the vision had become perception of light (PL) in the right eye. At this point there was a clearly visible cherry red spot on fundus examination with RAPD.
- A repeat OCT now demonstrated marked inner retinal oedema in the right eye.
- On review of his presenting OCT with normal fundus examination, evidence of inner retinal ischaemia is apparent (figure 1).

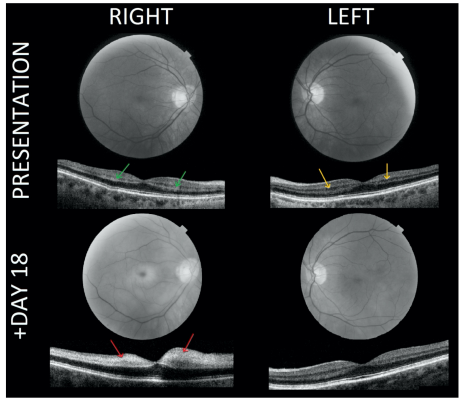


Figure 1: Evolution over time of OCT signs of ischemia in patient 1. In the images at presentation the inner nuclear layer of the right eye is hyperreflective (arrows) with prominent middle limiting membrane compared to the fellow eye which has a normal appearance (arrows). After 18 days there is a marked diffuse inner retinal oedema and continuous blurring of the retinal layers (arrows) as compared to the normal left eye where inner retinal architecture is preserved.

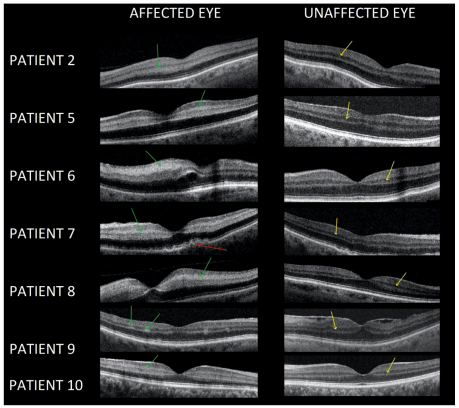


Figure 2: Comparison of OCT images of affected against unaffected eye. The arrows in the affected eyes demonstrate prominent middle limiting membranes, hyperreflectivity of the inner retinal layers and retinal oedema with continuous blurring of the retinal layers. This is compared to the normal appearance (arrows) in fellow unaffected eyes. Patient 7 was diagnosed with having a choroidal neovascular membrane at presentation, assumed because of associated drusen.

Conclusion

This is the first case series to report on the OCT findings of occult CRAOs. In this study, all patients that were initially given a diagnosis other than CRAO had evidence of inner retinal ischaemia on OCT. As demonstrated by the images in this study, when careful attention is paid to the inner retinal layers comparing to the unaffected eye, it can often become apparent that subtle ischaemia is present. The recognition of inner retinal ischaemia on OCT is often an under recognised sign in occlusive arterial aetiology. Increased awareness and education on the interpretation of OCT in CRAO may help facilitate prompt recognition facilitating earlier diagnosis and referral to stroke services and therefore potentially reduce patient morbidity and mortality.

Conflict of interest: None to declare
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