CASE REPORT

Acute and chronic spectral domain optical coherence tomography features of branch retinal artery occlusion

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SUMMARY

Branch retinal artery occlusion (BRAO) is a common vascular occlusive disorder. BRAO involving the posterior pole is usually symptomatic, but occasionally has very limited clinical features. We describe 2 cases where the underlying pathology was initially unclear and the diagnosis therefore not reached at presentation. Use of the latest retinal imaging, spectral domain optical coherence tomography (SD-OCT) enabled correct diagnosis of BRAO. The images demonstrate and contrast the fine changes that can be seen in the acute and chronic phases of this condition and illustrate how the pathogenesis of BRAO is confined to the outer retinal layers. We believe the subtle presentations of this common condition that we discuss highlight how diagnosis of BRAO can often be challenging, but may be facilitated by the use of SD-OCT retinal imaging.

BACKGROUND

Branch retinal artery occlusion (BRAO) is a common retinal pathology, accounting for 38% of acute retinal artery obstructions.¹ Most present with obvious clinical findings, with emboli visible in approximately 68%.² Cases with very subtle signs like the two we describe are uncommon and perhaps often missed which is why we wish to publish this case report. Use of the latest imaging techniques can help demonstrate that the pathology is located in the outer retinal layers and help differentiate between the diagnosis of acute or chronic BRAO.

CASE PRESENTATION

A 59-year-old man presented with painless overnight reduction of right central vision to counting fingers. He was awaiting cataract surgery with 6/60 vision previously in the right eye and no medical history. There was no relative afferent papillary defect, and dilated funduscopy was challenging owing to cataract, but initially deemed normal leaving no clear diagnosis (figure 1A).

A 51-year-old man had similar acute visual loss in the right eye, with paracentral scotoma, but preserved visual acuity (6/4). There was no ocular or medical history. He presented 1 year previously to a different eye department. At that time he was found to have an apparently normal ocular examination, macular spectral domain optical coherence tomography (SD-OCT) scan, fundus fluorescein angiogram, brain and orbits CT and MRI. Routine blood investigations were normal, but he was

referred to our clinic owing to repeatable visual field defect affecting the area superior nasal to visual fixation (figure 2A). Fundus examination revealed subtle abnormalities (figure 2B): highly refractile particle temporal to the optic disc obstructing small arteriole (most likely a cholesterol embolus, also known as a Hollenhorst plaque) and large retinal nerve fibre layer wedge defect.

INVESTIGATIONS

Spectral domain optical coherence tomography (SD-OCT) is an increasingly utilised retinal imaging modality that uses light in the near-infrared spectrum to create high-resolution cross-sectional images of the retina. Light that is reflected off the retina is detected and converted into images in a manner analogous to sound waves in ultrasonography. SD-OCT is now probably the most widely available and easily accessible retinal imaging technique in hospital ophthalmology department and high street opticians and non-invasive with no associated risks or side effects.

SD-OCT scan of the first patient presenting with acute onset of visual change showed normal foveal contour (figure 1B), but obvious superior retinal thickening (without any intraretinal spaces) (figure 1C). Thickening was confined to inner retinal layers and caused shadowing of underlying structures: the photoreceptor inner segment/outer segment junction and retinal pigment epithelium layers were obscured. The extent of retinal oedema was clearly demonstrated using three-dimensional reconstruction (figure 1D).

The second patient being investigated for chronic paracentral visual loss, also had an SD-OCT scan: inferior to the fovea, it demonstrated inner retinal thinning nasally, with normal outer retinal layers (figure 2C). The area of retinal atrophy on three-dimensional reconstruction (figure 2D) corresponded to the visual field defect.

Both patients had a normal erythrocyte sedimentation rate (ESR). It was not felt that further investigation with fundus fluorescein angiography (FFA) at our department was required for either patient, but this could be performed if the diagnosis is still uncertain or if fundus examination is not clear.

DIFFERENTIAL DIAGNOSIS

Inner retinal thickening with the absence of intraretinal spaces seen on the SD-OCT scan of the first patient is an indirect sign of acute retinal ischaemia. This is most commonly secondary to acute BRAO.³

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Figure 1 Acute branch retinal artery occlusion demonstrated with colour fundus photograph (1A), spectral domain optical coherence tomography line scans (1B and 1C) and three-dimensional reconstruction (1D).

Inner retinal thinning is an indirect sign of chronic retinal ischaemia, most commonly secondary to previous BRAO.⁴ This diagnosis is made by the visible Hollenhorst plaque.

Another possible cause of acute retinal ischaemia is an arteritis, however, this is very unlikely to be present only in a focal region of the retina, and the absence of any clinically visible vasculitis in the retina or any systemic features makes this highly unlikely. A normal ESR and lack of systemic symptoms also made giant cell arteritis unlikely.

TREATMENT

Unfortunately, there is no proven treatment for BRAO and it is therefore likely to result in varying degrees of permanent visual loss. Patients diagnosed with BRAO require a full medical

Figure 2 Chronic branch retinal artery occlusion demonstrated with automated Humphrey visual field plot (2A) colour fundus photograph (2B), spectral domain optical coherence tomography line scan (2C) and 3-dimensional reconstruction (2D).

workup, in particular regarding cardiovascular risk factors and the cardiovascular system.

As the cause is usually embolic, carotid endarterectomy for significant carotid artery stenosis, may be required. Other less common underlying causes are coagulopathies or cardiac arrhythmias for which systemic anticoagulation may be indicated. Further investigation of our patients did not identify any significant systemic disease.

OUTCOME AND FOLLOW-UP

Patients with retinal artery occlusion are at very small risk of ocular neovascularisation. They can therefore be discharged after observation for 3–6 months to look for signs of progression. Pan-retinal photocoagulation should be performed in the rare instances when neovascularisation occurs.

DISCUSSION

The original OCT imaging that was initially available for clinical use for the eye was time-domain OCT. This offered much lower resolution images than the latest available SD-OCT can produce. Increasing use of SD-OCT enables early recognition of subtle disease. SD-OCT is most commonly used in the diagnosis and monitoring of chronic retinal diseases such as macular degeneration, diabetic retinopathy and glaucoma.⁵ A case report of time-domain OCT findings of acute BRAO using was published in 2010.⁶

BRAO can occur secondary to the common cardiovascular risk factors,⁷ but can also occur following concurrent unusual ophthalmic,⁸ as well as non-ophthalmic issues.^{9–10} It should therefore be considered when clinical findings demonstrate signs of acute or chronic retinal oedema, which are indirect signs of retinal ischaemia. In cases where the diagnosis remains unclear, FFA findings would be helpful and should be considered. However, we believe that OCT has a role with the advantage of being non-invasive and without the associated risks that FFA carries.

In these cases, the retinal arterial circulation was implicated because only the inner retinal layers which it supplies were affected, with ischaemia causing oedema in the acute period. In the chronic setting, inner retinal atrophy was demonstrated, while the outer retinal layers which are perfused by the choroid remained normal. Identifying which retinal layers are most involved helps localise the pathology, permitting correct diagnosis and management.

Competing interests None.

Patient consent Obtained.

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Learning points

- ▶ Branch retinal artery occlusion is a common retinal pathology that can present with subtle signs and symptoms.
- ▶ Spectral domain optical coherence tomography is a readily available alternative investigation that can aid the diagnosis and highlight pathology of the outer retinal layers.
- ▶ In the acute setting retinal ischaemia causes oedema of the outer retinal layers leading to masking of the inner retinal layers.
- ▶ In the chronic setting, ischaemia causes atrophy and thinning of the outer retinal layers.

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