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MULTIMODAL IMAGING IN ACUTE POSTERIOR MULTIFOCAL PLACOID PIGMENT EPITHELIOPATHY DEMOSTRATING OBSTRUCTION OF THE CHORIOCAPILLARIS.

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Abstract:

Optical coherence tomography angiography (Angio-OCT) provides non-invasive in-vivo vascular imaging of the retina and choriocapillaris. To highlight Angio-OCT utility we align structural changes and their resolution with functional outcome. We present a case of acute posterior multifocal placoid pigment epitheliopathy (APMPPE) and sequential changes during transition to inactive disease. In the acute phase, altered flow and non-perfusion were seen in defined islands of choriocapillaris. Over time progressive re-perfusion was observed and accompanied clinical resolution and functional visual restoration. The imaging features acquired described the level of non-perfusion we had assumed when extrapolating findings from multiple independent imaging modalities.

Introduction

Acute posterior multifocal placoid pigment epitheliopathy (APMPPE) was first described by Gass as a condition that affects the choriocapillaris, retinal pigment epithelium (RPE), and outer retinal layers.[1] However, the pathophysiology in APMPPE is not well understood, with no histopathologic studies reported due to the condition's transience.[2] Nevertheless, continued advances in ophthalmic imaging have provided additional information, but still none has demonstrated a direct primary involvement of the choriocapillaris, which remains inferred.[3-5]

Fluorescein (FA) and indocyanine green (ICG) angiography are well-established invasive techniques for assessing, in part, retinal and choroidal flow and defining active disease in APMPPE. The typical angiographic findings in APMPPE are well reported. However, localisation of lesion depth can be difficult, particularly in the context of blocking and staining by lesions.

Fundus autofluorescence (FAF) findings also have been described in this pathology and overlapping entities such as macular serpiginous choroidopathy, with hypoautofluorescent in the acute lesion, and subsequently hyperautofluorescence to final hypoautofluorescence of the lesions due to retinal pigment epitethelium (RPE) damage.[4, 6]

These two-dimensional modalities do not provide segmental views of the retinal plexus and choriocapillaris. Optical coherence tomography angiography (Angio-OCT) provides a means for in-vivo direct visualization of the vascular flow and microstructure in the retina and choroid.[7] The technology allows segmentation to specific depths, including deep and superficial plexus and choriocapillaris, with potential to localise and delineate

pathology. We present a case of acute APMPPE studied with multi-modal imaging including Angio-OCT and describe evolution over time.

Case report

A 27-year-old man presented with a three-day history of bilateral central visual loss after a viral 'flu' like illness. Visual acuity was 0.3 (logMAR) in the right eye and 1.0 (logMAR) in the left eye with no intraocular cellular activity. Multiple cream-coloured placoid lesions were present in the central macular area of both eyes. Classical features were present and included: FA features of early hypofluorescent lesions with hyperfluorescent borders and late staining (Figure 1); indocyanine green angiographic (ICG) features of persistent hypofluorescent lesions in the late frames as well as classical hypofluorescent ICGA lesions that were not initially evident on FA imaging (figure 1).

Angio-OCT (AngioVue; Optovue Inc., Fremont, California, USA) segmentation images demonstrated normal morphology and texture of the superficial and deep capillary retinal plexus. The choriocapillaris was imaged with segmentation below the retinal pigment epithelium (RPE) and alterations to the capillary density and pattern were evident. Features included disruption of the typical packed honeycomb structure at the central fovea within lesions. The morphology and texture of the choriocapillaris angio-flow was disrupted indicating reduction of vascular flow. Defined areas of non-perfusion corresponded to the lesions observed on FA and ICG angiography. These patterns were not observed in areas of normal retina and were clearly differentiated from artefacts. En-face OCT at the level of the choriocapillaris areas revealed hyporeflectance corresponding with the area of impaired choriocapillaris perfusion. Fundus autofluorescence (FAF) demonstrated ill-defined hypoautofluoresence of the lesions.

Infrared reflectance (IRR) disclosed ill-defined areas of hyperreflectance corresponding with the lesions. Spectral domain optical coherence tomography (SD-OCT) at the level of the fovea revealed significant disruption, including partial disappearance of the ellipsoid zone in areas corresponding to the lesions (figure 2, figure 3).

The clinical and imaging features were consistent with the diagnosis of APMPPE. Syphilis, HIV serology, and QuantiFERON Gold tests performed at presentation, were negative. Oral corticosteroid was commenced (prednisolone 60mg OD) because of central macular involvement with severe visual impairment at presentation. Over the following three weeks, the placoid lesions progressively faded and were replaced by hyperpigmentation and atrophy (figure 2, figure 3). The visual acuity improved to 0.0 (logMAR) in both eyes over the course of 3 weeks and oral prednisolone was tapered according to clinical resolution. Sequential FAF imaging demonstrated progressive development of hyperautofluoresecence at the edges of the lesions (figure 2, figure 3). IRR showed a progressive definition of the lesion borders and increase in the hyperreflectance over time. The en face OCT showed a progressive increase in the hyperreflectance of the lesions (figure 2, figure 3). SD-OCT demonstrated a restoration of the inner segment ellipsoid layer but persistent disruption of the RPE within the lesions (figure 2, figure 3). Repeat Angio-OCT images (at 3, 11 and 21 days after presentation) demonstrated changes in choriocapillaris flow images with progressive evidence of reduction in extent of the non-perfused areas and signs of vascular re-perfusion (figure 2, figure 3).

Discussion

The nature of lesions and associated choriocapillaris non-perfusion in APMPPE remains elusive. Using Angio-OCT this case demonstrates isolated choriocapillaris non-perfusion within 'placoid' lesions in the active disease phase. Our images support theories of primary choriocapillaris pathology in this condition.[8] During disease resolution, sequential improvement in flow and reduction in size of the non-perfused area was seen supporting previous inferences that vascular re-perfusion and re-modelling occurred. This technology provides new imaging evidence of the site and area of choriocapillary vascular pathology during the acute and later phases of the disease. These Angio-OCT findings support the notion that APMPPE is a primary inflammatory choriocapillaropathy,[8] where the visualisation of non-perfusion in the lesions may be the consequence of occlusive vasculitis.

Angio-OCT is a non-invasive and quick image modality for the detection and monitoring of choriocapillary involvement in APMPPE patients. This new technology is a potential alternative to invasive angiography. Further studies are warranted to develop our understanding of Angio-OCT changes in inflammatory diseases, particularly those involving the choriocapillaris.

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FIGURE LEGENDS:

Figure 1.- Fundus fluorescein angiography (FFA) and indocyanine green angiography (ICGA) at presentation. Row A shows the early frames of the angiography for the right (A1) and the left eye (A2). Row B and C show later frames for the right (B-C1) and the left eye (B-C2). Row D shows peripheral shots for the right (D1) and left eye (D2). The FFA disclosed early hypofluorescence of the lesions with late staining and leakage, ICGA showed persistent hypofluorescence during the angiogram, with evidence of multiple lesions, the majority of them not apparent in the FFA.

Figure 2.- Multimodal imaging of the right eye at presentation and follow-up. Row 1 shows the images at presentation, row 2 shows findings 4 days later, and row 3 shows findings 11 days after presentation, and row 4, 21 days. Column A represents the colour pictures, column B OCT angiography findings, column C shows fundus autofluorescence, column D spectral domain OCT findings.

Figure 3.- Multimodal imaging of the left eye at presentation and follow-up. Row 1 shows the images at presentation, row 2 shows findings 4 days later, and row 3 shows findings 11 days after presentation, and row 4, 21 days. Column A represents the colour pictures, column B OCT angiography findings, column C shows fundus autofluorescence, column D spectral domain OCT findings.