

Descriptive Case Series on Optical Coherence Tomography Angiography Findings of Patients with Idiopathic Intermediate Uveitis in a Referral Ophthalmological Centre at Mexico City

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Abstract

Purpose: To identify signs of inflammatory activity in patients with idiopathic intermediate uveitis (IIU) using OCT angiography (OCTA).

Methods: This is a descriptive case series at the Asociación para Evitar la Ceguera en México, comparing OCTA images in patients with the diagnosis of IUU with their clinical and fluorescein angiography (FA) findings.

Results: Seventeen eyes of nine patients were recruited into the study, OCTA images were not useful to distinguish between patients with active or inactive inflammation. Eyes with cystic macular edema (CME) had foveal avascular zones smaller than other patients.

Conclusion: At the time OCTA does not provide any useful information on patients with IUU. Our findings regarding CME correlate with those previously reported.

Keywords: OCT angiography; Idiopathic intermediate uveitis

Introduction

Idiopathic intermediate uveitis (IIU) is an idiopathic chronic uveitis, which mostly affects children and young adults. The prevalence of IIU varies from 5% to 25% [1] and comprises 10% of all cases of uveitis [2]. The main site of inflammation is the vitreous, peripheral retina and pars plana. It is associated with snowbank and snowball formation with no infectious or systemic disease related [3]. Sheathing of peripheral retinal venules is a common clinical finding in patients with IIU; they can show retinal vasculitis in a 17 to 90% of the cases [2]. Periarteritis may also be found less frequently and it is associated with whitish infiltrates in the peripheral retina; all of the above can lead to peripheral neovascularization [4]. Cystoid macular edema (CME) is a common complication of IIU presenting in over 40% and one of the most sight threatening complications we see in IIU [5-7]. Fluorescein angiography (FA) is an invaluable tool in the diagnosis and follow up of patients with IIU. In it we can see vascular staining and leakage as well as CME [6]. These findings may not correlate with clinical signs of active inflammation, making FA a very important test for the diagnosis and follow up of patients with pars planitis. The main drawback of FA is in its invasive nature, it involves contrast medium injection into a peripheral vein. Serious adverse effects are rare, nausea and vomiting after the injection of fluorescein are the most common, but others include extravasation and local tissue necrosis, vasovagal reaction, allergic reactions and thrombophlebitis [8]. Additionally, cooperation from the patient after venopuncture makes it impossible to repeat the study each visit. Optical coherence angiography (OCTA) is a non-invasive, dye free imaging technique that uses blood flow to create angiographic images in seconds. It compares several OCT scans and

detects movement to create the blood flow map, providing flow information at a fixed point in time [9]. OCTA can provide very detailed 3D images of the retinal vessels, being able to differentiate between the superficial and deep vascular layers of the retina, feat not possible with traditional dye based angiography [10]. OCTA has been around since 2006, but older scan rates and software processing made it to slow to be practical. Recently faster scan rates and higher resolutions have made possible the wide spread clinic use of OCTA. Several studies have validated its reproducibility and made correlations between FA and OCTA [9,11]. More studies are needed to evaluate the practical use of OCTA in the daily practice to diagnose and follow retinal vasculature abnormalities in diseases such as IIU [9]. To our knowledge no studies have shown the specific findings of the OCTA in patients with IIU.

Methods

This is a descriptive case series, we recruited IIU patients from the ocular inflammatory diseases department at the Asociación para evitar la ceguera en México (APEC). All patients had a FA within 3 months of the examination. OCTA images were acquired between June and August 2016. For patients who did not have clear media, or did not cooperate, acquiring a OCTA image was impossible, these were not included in the present study. OCTA images were acquired using Topcon's DRI OCT Triton (Topcon Tokyo, Japan) with swept source technology using a 1050nm laser obtaining 100,000 a-scans per second. A 3 × 3 mm macular cube was obtained for the Image analysis and image processing was made by OCTARA image processing algorithm that compares several scans at different points of time, generating a de-correlation signal to generate the images. Patients were divided into active and non-active categories based on the clinical examination and FA findings. The presence of cells or flare in the

anterior chamber as well as vitreous haze were considered as signs of activity [12]. CME, vascular leakage, parietal staining and fern pattern were taken as signs of inflammation in the FA. Images of the fluorescein angiography and OCTA including superficial and deep capillary plexus for each eye were put into a worksheet for analysis using numbers for mac (Apple Cupertino, CA). These images were then showed randomly to two different specialists who classified them as active or non-active separately.

Case	Gender	Age	Eye	Activity FA	CME FA
1	F	9	Right eye Left eye	- -	- -
2	F	15	Right eye Left eye	+ +	+ +
3	M	43	Right eye	+	+

			Left eye	+	+
4	M	9	Right eye Left eye	NA +	NA +
5	M	30	Right eye Left eye	- -	- -
6	M	21	Right eye Left eye	- +	- +
7	F	9	Right eye Left eye	+ +	+ -
8	F	48	Right eye Left eye	+ +	+ +
9	F	13	Right eye Left eye	- -	- -

Table 1: Summary of patients included in the study.

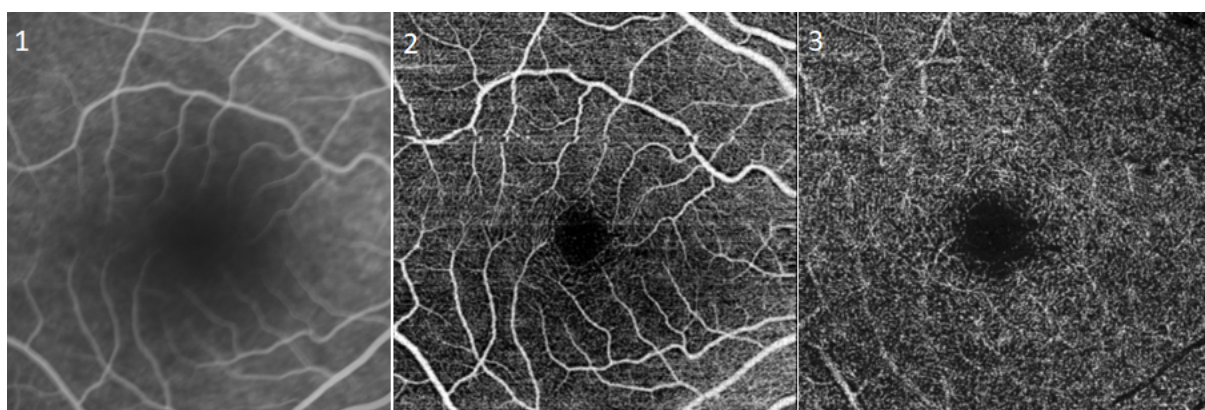


Figure 1: A normal capillary net can be observed in both the deep and superficial capillary net of the right eye, motion artefacts can be seen in the superficial plexus image.

Results

Seventeen eyes were recruited from nine patients (5 females and 4 male) into the study, with a mean age of 21.88 years (range 9-48). FA results showed 10 eyes with active disease (58.8%) and 9 with CME (52.9%). Patient findings are summarised in Table 1. OCTA findings included 7 eyes with motion related artefacts (41.1%). 16 of 17 eyes showed a superficial and deep capillary plexus within normal limits regardless of inflammatory status by FA. 3 eyes with CME seen on FA showed smaller foveal avascular zones (FAZ) both at the superficial and deep plexus in AOCT. A short clinical history and pictures of four patients are included next Patient 1 (Figure 1).

A 9 year old female patient has a visual acuity of 20/20 in her right eye and counting fingers in her left eye. She had the clinical diagnosis of IUU two years ago being treated with and underwent vitreous surgery a year before due to severe vitritis, she developed posterior synechiae in the same eye making it hard to obtain images of that eye. Inflammation has been considered as inactive since a year ago. Patient 2 (Figure 2) A 15 year old patient has had the diagnosis of IUU since 2009 receiving treatment with oral and periocular steroids in several occasions since, vision remains 20/30 in both eyes despite chronic

relapsing inflammation. During her visit to the clinic a routine FA was solicited and typical signs of inflammation were observed. Patient 3 (Figure 3).

A 43 year old man started with decreased vision on his right eye and floaters. He attended the clinic when he noted more floaters in his left eye. Upon the examination, anterior chamber cellularity 2+ was present as well as vitritis and periferal vascular sheeting. IUU was diagnosed and treatment with oral and periocular steroids was initiated. Patient 6 (Figure 4) A 21 year old male patients has been diagnosed with IUU for the past 5 years, he is currently being treated with methotrexate 0.9 ml sub cutaneous. Visual acuity is 20/40 for the right eye and 20/60 for the left eye.

Discussion

In this study we compared OCTA of patients with IUU diagnosis who were deemed to have active inflammation or no active inflammation by FA. The purpose was to investigate the possible correlation of OCTA findings with inflammatory activity of IUU, in order to avoid repeated intravenous fluorescein injection in these

patients. OCTA generates images of the retinal capillaries by detecting blood-flow rather than imaging the diffusion of certain dyes injected into the blood stream [9], this makes it possible to distinguish between the two different vascular plexus but it cannot assess dye leakage which is the principal inflammation sign on FA. A clear example of the advantages of OCTA can be seen in chronic central serous chorioretinopathy, in which sometimes irregular pigment epithelium detachments can be seen and FA does not provide evidence of a type 1 neovascularization. These type of neovascularization can be distinctively imaged by OCTA [13,14].

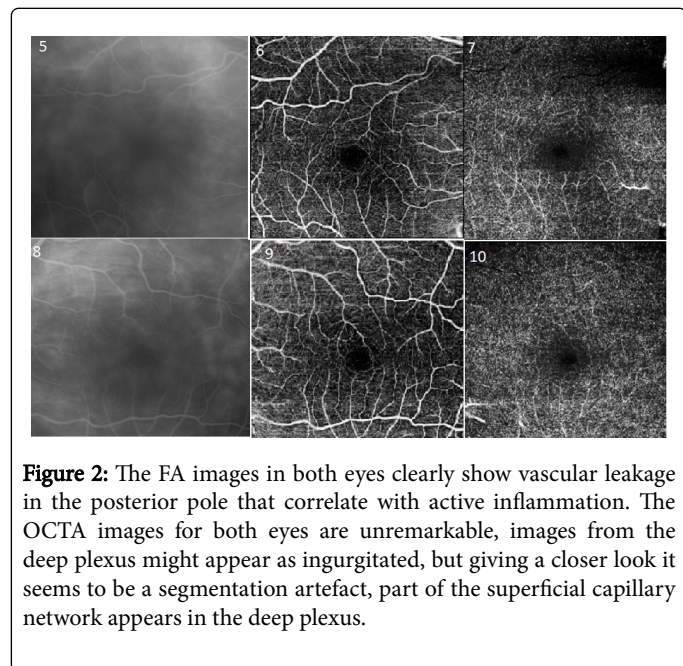


Figure 2: The FA images in both eyes clearly show vascular leakage in the posterior pole that correlate with active inflammation. The OCTA images for both eyes are unremarkable, images from the deep plexus might appear as ingurgitated, but giving a closer look it seems to be a segmentation artefact, part of the superficial capillary network appears in the deep plexus.

OCTA has proven itself useful in the study of uveitis; such is the case of punctate inner choroidopathy (PIC) and multifocal choroiditis, in which the presence of multiple hiperfluorescent spots can make the diagnosis of a choroidal neovascularisation very difficult. With OCTA Levison et al. were able to demonstrate the definitive presence of CNV in 11 of 12 patients with PIC, while the CNV was not visible in the FA of 7 of the same patients [15]. In patients with other types of uveitis, a lower density and complexity of choriocapillaries has been described [16-18]. In contrast OCTA was found of no use in multiple evanescent white dot syndrome (MEWDS) in imaging the typical lesions that are easily seen in FA. In the same study en face OCT was also performed and showed hyporreflective spots at the level of the ellipsoids corresponding to the hiperfluorescent dots seen on FA [19]. Kim et al. described a heterogeneous uveitic group of patients, none with intermediate uveitis, with alteration in the deep parafoveal capillary density as well in the branching of them, making OCTA a useful tool to evaluate disease severity [17]. Quantification of the foveal avascular zone (FAZ) may also provide information for diagnosis and treatment of vascular retinal diseases. Chui et al. investigated foveal thickness and FAZ diameter, and concluded that there is a correspondence with central foveal thickness and FAZ. The thicker the fovea, the smaller the FAZ area and viceversa. This theory can explain our patient 3 RE, with CME, and no FAZ [7]. In our case series we did not find any difference in the OCTA images of the patients with or without active inflammation, this means that the inflammation that occurs in the blood vessels secondary to pars planitis does not affect the blood flow

of the fovea. There seems to be a relationship between the presence of CME and small FAZ consistent with the findings of Chiu et al. [7].

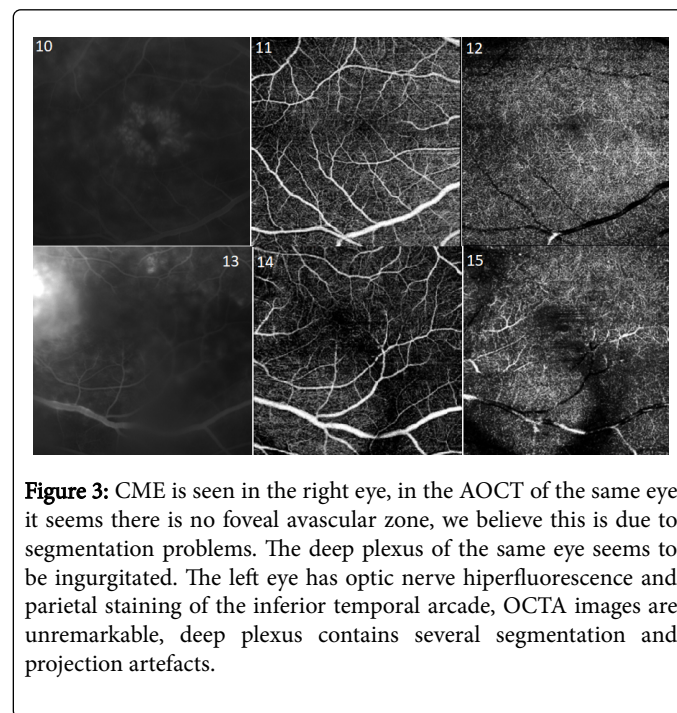


Figure 3: CME is seen in the right eye, in the AOCT of the same eye it seems there is no foveal avascular zone, we believe this is due to segmentation problems. The deep plexus of the same eye seems to be ingurgitated. The left eye has optic nerve hiperfluorescence and parietal staining of the inferior temporal arcade, OCTA images are unremarkable, deep plexus contains several segmentation and projection artefacts.

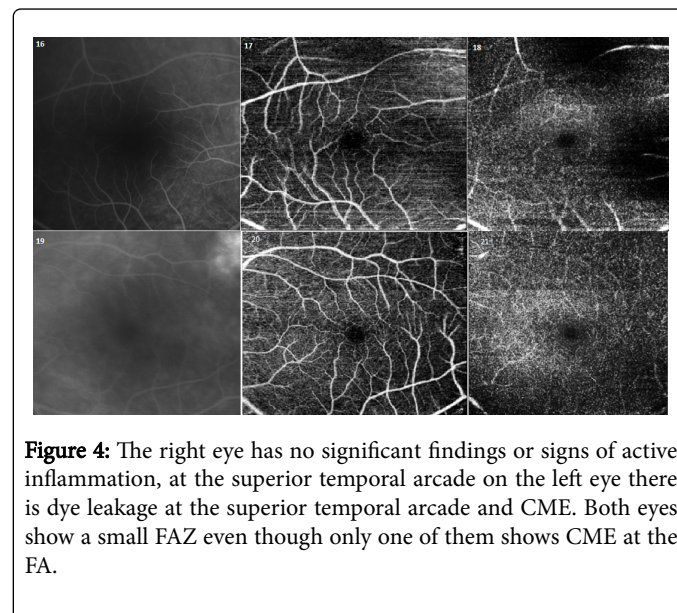


Figure 4: The right eye has no significant findings or signs of active inflammation, at the superior temporal arcade on the left eye there is dye leakage at the superior temporal arcade and CME. Both eyes show a small FAZ even though only one of them shows CME at the FA.

It would be interesting to obtain en face OCT scans of the same patients to see if hiperfluorescent lesions in the posterior pole can be imaged without the use of a dye based imaging study. Furthermore imaging analysis in the future might provide more information such as vascular density or caliber which could detect changes not seen by looking at images alone. There are two main limitations for this study, the first one is a small sample size. The second one is the subjective nature of imaging analysis. The changes produced in blood flow may be too subtle to be noticed by looking at the images on the screen. It is worth noting that OCTA depends on the image processing algorithm and that newer and better softwares may provide better images, or quantitative data on blood vessel density and form which

may prove useful in the future. To our knowledge this is the first study that reports OCTA findings in patients with IIU. In conclusion, while OCTA is a great new imaging tool for neovascularization and structural blood vessel changes, it is not a suitable imaging technique for finding inflammatory changes in patients with IIU at this time. Furthermore it does not provide any useful information for the diagnosis or follow up for these patients. En face OCT might prove useful in this specific group of patients as it has been proven in other inflammatory conditions like MEWDS.

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