Evaluation of subfoveal choroidal thickness in patients with posterior uveitis

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Abstract---Background: Posterior uveitis can have inflammation involving the retina and choroid along with inflammation adjacent structures such as vitreous, optic nerve head, retinal vessels. Aim and objectives: The main aim of this study was to detect the changes in subfoveal choroidal thickness in posterior uveitis using OCT with enhanced depth of focus. Subjects and methods: This prospective study was carried on thirty patients presented with posterior uveitis attending to ophthalmology department of Al azhar university hospitals and Kobry El Qobba Military specialized eye hospital, Cairo, Egypt. The study duration ranged from 6-12 months. Results: as regard the main fundus changes distribution among the studied patients; the most prevalent finding was Chorioretinitis (46.5%) while choroiditis was found in 30.2% and retinitis was found in 23.3%. Also the SFCT was significantly higher in patients than control eyes. Conclusion: increase SCFT may be a clue for detection of sub clinical inflammatory activity of retina and choroid during quiescent phase.

Keywords---central foveal thickness, choroidal thickness, enhanced-depth imaging, optical coherence tomography, uveitis.

Introduction

Uveitis is a sight-threatening inflammation inside the eye that affects both the uveal tract (which is composed of the iris, choroid, and ciliary body and adjacent structures (including the sclera, cornea, vitreous humor, retina and optic nerve head). uveitis can cause transient or permanent visual impairment and ocular complications that are not responsive to therapy. Uveitis can occur either as a co-
manifestation of various autoimmune disorders and infections or as a side effect of medications and toxins, or it can arise as a purely idiopathic ocular inflammation.  

Posterior uveitis can have inflammation involving the retina and choroid along with inflammation adjacent structures such as vitreous, optic nerve head, retinal vessels. There are many causes of posterior uveitis include infectious and non-infectious causes: Toxoplasmosis Toxocariasis Tuberculosis (TB) Syphilis Bartonella Viral (Herpes simplex, Varicella zoster, cytomegalovirus [CMV]) Human immunodeficiency virus (HIV)-related eye diseases. Acute posterior multifocal placoid pigment epitheliopathy (APMPPE) multiple evanescent white dot syndrome (MEWDS) Birdshot choroidopathy Sarcoidosis behcet.

Optical coherence tomography (OCT) is a non-invasive tool used to visualise the posterior areas of the ocular fundus and is frequently used for the assessment of retinal diseases. However, conventional spectral-domain OCT devices have limitations in imaging the choroid because of decreased sensitivity and resolution due to several reasons such as wavelength-dependent light scattering and signal loss in the image path. Enhanced depth imaging OCT (EDI-OCT) has made it possible to easily obtain detailed images of the choroid. The main aim of this study was to detect the changes in subfoveal choroidal thickness in posterior uveitis using OCT with enhanced depth of focus.

**Patients and Methods**

This was a prospective study that carried on thirty patients presented with posterior uveitis attending to ophthalmology department of Al azhar university hospitals and Kobry El kobba Military specialized eye hospital, Cairo, Egypt.

Complete ophthalmological evaluation was done for all patients who included: Complete history taking and medical checkup when needed: History: patient information (age, sex, occupation and residence), any chronic disease (e.g. diabetes) and surgical ophthalmic history. Complete clinical ophthalmological examination. Visual acuity: The unaided, best corrected visual acuity (BCVA) expressed as (logMAR). Slit lamp examination. Dilated fundus examination using indirect ophthalmoscope and slit lamp biomicroscopy for assessment of macula, optic nerve, retinal periphery IOP measurement with applanation tonometry. Investigations: OCT with enhanced depth of focus and FFA.

Inclusion criteria: All patients with posterior uveitis
Exclusion criteria: Patients with mental and/or physical handicap preventing imaging, patients diagnosed with DM, patients diagnosed with any vascular retinal diseases, patients with dense cataract or any other media opacity obscuring adequate clinical evaluation or imaging and any contraindications for FFA.

Data analysis: The data collected in the study was processed, coded and entered into a personal computer. Microsoft SPSS (Statistical Package for Social Sciences) was used for data analysis. Data was illustrated in the form of tables and figures by EXCEL program.

Ethical considerations: An informed consent was obtained from all participants in the study before conducting the interviews; the patient has the right to participate
or withdraw from the study at any time. The patient has the right to be fully informed about the study. All patients’ information and identities in the study should be kept confidential to the researchers only.

**Results**

Table (1): Demographic data distribution among the studied patients

<table>
<thead>
<tr>
<th>Variable</th>
<th>Patients (n=30)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years) Mean ± SD</td>
<td>49.87 ± 3.27</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>18 (60%)</td>
</tr>
<tr>
<td>Male</td>
<td>12 (40%)</td>
</tr>
</tbody>
</table>

The mean age was 49.87 ± 3.27 years and most of the patients were females (60%). Table (1)

Table (2): Posterior uveitis causes distribution among the studied patients

<table>
<thead>
<tr>
<th>Causes</th>
<th>Patients (n=30)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Infectious</td>
<td></td>
</tr>
<tr>
<td>Idiopathic</td>
<td>5 (16.7%)</td>
</tr>
<tr>
<td>Behçet</td>
<td>7 (23.3%)</td>
</tr>
<tr>
<td>Vogt Koyanagi–Harada disease (VKH)</td>
<td>6 (20%)</td>
</tr>
<tr>
<td>Multifocal choroiditis (MFC)</td>
<td>4 (13.3%)</td>
</tr>
<tr>
<td>Birdshot chorioretinopathy (BSCR)</td>
<td>2 (6.7%)</td>
</tr>
<tr>
<td>Non-Infectious Herpes virus</td>
<td>2 (6.7%)</td>
</tr>
<tr>
<td>Non-Infectious Toxoplasma</td>
<td>4 (13.3%)</td>
</tr>
</tbody>
</table>

The major cause was Behçet disease followed by Vogt-Koyanagi–Harada disease (20%). Moreover, 80% of the patients were due to non-infectious causes and 20% of the patients were due to infectious causes. Table (2)

Table (3): Anterior segment involvement distribution among the studied patients

<table>
<thead>
<tr>
<th>Patients (n=43 eyes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
</tr>
</tbody>
</table>

Only 37.2% of the patients showed Anterior segment involvement. Table (3)

Table (4): Best corrected visual acuity and intra ocular pressure among the studied patients

<table>
<thead>
<tr>
<th>Patients (n=30)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BCVA Mean ± SD</td>
</tr>
</tbody>
</table>
The mean BCVA was 0.142 ± 0.185 and mean IOP 13.65 ± 3.87 mmHg. Table (4)

Table (5): Main fundus changes distribution among the studied patients

<table>
<thead>
<tr>
<th></th>
<th>Patients (n=43 eyes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chorioretinitis</td>
<td>20 (46.5%)</td>
</tr>
<tr>
<td>Choroiditis</td>
<td>13 (30.2%)</td>
</tr>
<tr>
<td>Retinitis</td>
<td>10 (23.3%)</td>
</tr>
</tbody>
</table>

The most prevalent finding was Chorioretinitis (46.5%) while choroiditis was found in 30.2% and retinitis was found in 23.3%. Table (5)

Table (6): Subfoveal choroidal thickness among the studied patients

<table>
<thead>
<tr>
<th>SFCT (µm)</th>
<th>Patients (n=44 eyes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean ± SD</td>
<td>358.65 ± 49.73</td>
</tr>
<tr>
<td>Range</td>
<td>296 – 576</td>
</tr>
</tbody>
</table>

The mean SFCT was 358.65 ± 49.73 µm. Table (6)

**Discussion**

Uveitis is an inflammatory disease that involves the uvea, retina, retinal vessels, and vitreous body and most commonly affects young adults. Approximately 60%–80% of patients are in the third through sixth decade of life, with onset typically between the ages of 35 and 45. There are various classification methods for uveitis, but the most widely used method is that devised by the International Uveitis Study Group (IUSG), which is based on the anatomic location of inflammation as follows: anterior uveitis, intermediate uveitis, posterior uveitis, and panuveitis. 4

OCT is a non-contact technique that uses optical equivalents to construct a cross-sectional image of the retina in vivo. Over the past 15 years, OCT imaging has become widespread in ophthalmology. With the aid of OCT, macular edema can be detected in early phases. Moreover, EDI-OCT provides more detailed information on the choroid and permits qualitative and quantitative analyses of this layer. As such, EDI-OCT has been used to analyze CT in several diseases, including diabetic retinopathy, high myopia, and age-related macular degeneration. The etiology of uveitis is complex, and the clinical manifestations vary. Thus, EDI-OCT provides information necessary to better understand changes in retinal and choroidal microstructures during both disease progression and inactivity. 5

The main aim of this study was to detect the changes in subfoveal choroidal
thickness in posterior uveitis using OCT with enhanced depth of focus. The mean age was 49.87 ± 3.27 years and most of the patients were females (60%). The present study showed that most of the patients had unilateral posterior uveitis and 43.3% were bilateral. The major cause was Behçet disease followed by Vogt-Koyanagi–Harada disease (20%). Moreover, 80% of the patients were due to non-infectious causes and 20% of the patients were due to infectious causes. Our results were supported by study of Bozali et al., as they reported that the right eye of 4 patients (13.3%), the left eye of 5 patients (%16.6) were involved leading to unilateral ocular involvement in 9 patients (30%) in total. Seven patients (33.3%) had bilateral ocular involvement. They included 30 Behcet’s patients.

Whereas in the study of Fabro & Herbort, among 1872 uveitis patients seen from 1995 to 2016, 8 newly diagnosed birdshot retinochoroiditis (BRC) patients (16 eyes) and 6 newly diagnosed VKH patients (12 eyes). In contrary to our results study of Engelhard et al., as they revealed that the most common posterior uveitis diagnoses were toxoplasma uveitis (n=11, 17.74%), multifocal choroiditis (n=9, 14.52%), undifferentiated posterior uveitis (n=9, 14.52%), and birdshot chorioretinitis (n=7, 11.29%). The current study showed that only 37.2% of the patients showed anterior segment involvement. The mean BCVA was 0.142 ± 0.185 and mean IOP 13.65 ± 3.87 mmHg.

Khairallah et al., found that OCTA has a significantly higher sensitivity in detecting retinal microvascular changes in active BU than the gold standard fluorescein angiography (FFA); however, the patients were not followed up after remission. Similarly, Accorinti et al. conducted an OCTA study comparing eyes with active BU with others in a quiescent stage and found that there are significant differences in some parameters. In the study in our hands, as regard the main fundus changes distribution among the studied patients; the most prevalent finding was Chorioretinitis (46.5%) while choroiditis was found in 30.2% and retinitis was found in 23.3%. Retinal vasculitis was found in 32.6% and papillitis was found in 44.2%. Whereas in the study of Wassef et al., retinitis was found in 31% of their studied group and vasculitis was found in 62% of them. Choroidal thickness measuring in vivo has been reported in various diseases using different available methods/devices including ultrasound and OCT since 1979. To date, ChT has become a vital predictive imaging biomarker for both retinal and choroidal disorders. In-depth understanding of pathogenesis of these disorders drives us to understand the standard method to measure ChT. Posterior uveitis can have inflammation involving the retina and choroid along with inflammation adjacent structures such as vitreous, optic nerve head, retinal vessels.

Our results showed that as regard subfoveal choroidal thickness among the studied patients; the mean SFCT was 358.65 ± 49.73 µm. In the study of Yan et al., the mean CT was thinner nasally, thicker temporally and thickest at the subfovea. Mean subfoveal CT of the uveitis group was much lower than that of the normal group (229.9 ± 85.4 µm vs. 276.5 ± 74.1 µm, respectively; p<0.001), and there were also significant differences in CT between the two groups at the other 10 locations studied. Maruko et al., studied 16 eyes of eight patients with VKH disease and showed that patients with active VKH presented with thickening of the choroid and that CT decreased quickly with corticosteroid treatment. In
another report, da Silva et al., 15 measured 30 eyes of 16 patients with long-standing VKH and found that patients with VKH and long-standing disease had thinner choroids compared to controls.

In addition, Kim et al., 16 stated that mean subfoveal choroidal thickness in the acute phase of Behcet’s uveitis was significantly greater than that in the quiescent phase (398.77 ± 155.59 μm versus 356.72 ± 141.09 μm; P = 0.004). Subfoveal choroidal thickness in the quiescent phase was also significantly greater than that of the healthy population (259.96 ± 65.16 μm; P < 0.0001). Subfoveal choroidal thickness in the uninvolved fellow eyes of patients with unilateral Behcet’s uveitis was also evaluated and it was significantly greater than that of the healthy population (n = 13 eyes; P = 0.001).

Similarly, the study of Coskun et al., 17 which included 35 patients with posterior uveitis associated with BD, 35 patients with BD without ocular involvement, and 30 healthy controls, showed thinning of the subfoveal choroidal tissue in patients with BD-associated panuveitis. However, in the study of Wassef et al., 11, 26 eyes of 20 patients were included. With remission of active posterior uveitis, capillary density in both layers increased, only being significant in the superficial capillary plexus (SCP) 1.81 ± 3.57% (p = 0.025).

According to Chung et al., 18 the non-uveitic patients with BD (NUBD) group included 46 eyes in 24 patients; the Behçet uveitis in an inactive state (IUBD) group included 16 eyes in 11 patients; and the control group included 35 eyes in 23 individuals. The mean subfoveal choroidal thicknesses differed significantly among these groups. Choroidal thickness was significantly greater in the NUBD (310.5 ± 81.0 μm) than in the IUBD (263.1 ± 56.6 μm, p = 0.013) and control (256.9 ± 67.9 μm, p = 0.002) groups. The disease activity score was significantly higher in the NUBD than in the IUBD group (p < 0.001).

Moreover, Bozali et al., 6 revealed that mean foveal thickness in patients with BD was 216.06 ± 53.14 μm and mean subfoveal choroidal thickness was 363.21 ± 85.22 μm. Mean foveal thickness and subfoveal choroidal thickness in healthy controls was 211.65 ± 16.60 μm and 352.83 ± 87.11 μm respectively. There was no statistical significance between patients with BD and control group regarding foveal and subfoveal choroidal thickness.

Agarwal et al., 19 demonstrated that during the second follow-up, with the healing of the lesions, there was a significant reduction in the choroidal thickness at all levels by SS-OCT (p < 0.05). However, the rise at the second follow-up was not significant (17.03 vs. 16.25 at baseline, p = 0.15). Furthermore, Hosseini et al., 20 revealed that the mean SFCT in patients with OBD (ocular BD) was significantly greater than in patients without OBD (364.17 ± 93.34 vs 320.43 ± 56.70 μm; P = 0.008). The difference of mean SFCT between the active compared to quiescent phase was not statistically significant (368.12 ± 104.591 vs 354.57 ± 58.701 μm, P = 0.579).
Conclusion

Increase choroidal thickness may be a clue for detection of subclinical inflammatory activity of the retina and choroid during quiescent phase. Interestingly, choroidal thickness may be a promising parameter that can be used to characterized different diseases entities and monitor resolution of posterior pole inflammatory disorders and also the efficacy of treatment. In this respect, EDI OCT may add a great deal of information in management and follow up inflammatory process of retina and choroid in posterior uveitis

References


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