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ORIGINAL ARTICLE

Evaluation of Subfoveal Choroidal Thickness in Patients With Posterior Uveitis

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Abstract

Background: **Inflammation of the retina, choroid, and nearby tissues such the vitreous, optic nerve head, and retinal arteries may all occur in posterior uveitis.**

Aim and objectives: **The primary objective of this study was to use optical coherence tomography (OCT) with improved depth of focus to find changes in subfoveal choroidal thickness (SFCT) in posterior uveitis.**

Patients and methods: **Thirty patients with posterior uveitis who were visiting the ophthalmology departments of Al-Azhar University Hospitals and Kobry El-Qobba Military Specialized Eye Hospital in Cairo, Egypt, were the patients of this prospective research. The trial lasted between 6 and 12 months.**

Results: **As regard the main fundus changes distribution among the studied patients; the most prevalent finding was Chorioretinitis (56.7%) while choroiditis was found in 53.3% and retinitis was found in 30.0%. Also the SFCT was significantly higher in patients than control eyes.**

Conclusion: **An increase in subfoveal choroidal thickness (SCFT) may be a sign of subclinical inflammation in the retina and choroid that occurs during the quiescent period.**

Keywords: Choroidal thickness, Central foveal thickness, Enhanced-depth imaging, Optical coherence tomography, Uveitis

1. Introduction

A potentially blinding eye inflammation known as uveitis impacts both the uveal tract, which is made up of the iris, choroid, and ciliary body, as well as nearby tissues (encompassing the optic nerve head, sclera, cornea, vitreous fluid, and retina). Uveitis may result in ocular consequences that are not responsive to treatment, including temporary or permanent vision impairment. Uveitis may develop as an entirely idiopathic ocular inflammation, or it can co-occur with a number of autoimmune diseases and infections, or as a medication adverse effects and toxins.[1]

Inflammation of the retina, choroid, and nearby tissues such the vitreous, optic nerve head, and retinal arteries may all occur in posterior uveitis. There are both infectious and noninfectious causes of posterior uveitis. Toxoplasmosis, Toxocariasis, Tuberculosis (TB), Viral Syphilis with Bartonella (cytomegalovirus [CMV], varicella zoster, and herpes simplex) ocular issues brought on by the HIV virus. Acute posterior multifocal placoid pigmented epitheliopathy in the back (APMPPE) syndrome of several evanescent white dots multible evanscient white dot syndrome (MEWDS), a birdshot choroid disease Behcet sarcoidosis.[2]

In order to see the posterior regions of the ocular fundus and to detect retinal disorders, optical coherence tomography (OCT) is a noninvasive approach. However, because lower sensitivity and resolution is brought on by many factors, including wavelength-dependent light scattering, and signal loss in the image route, standard spectral-domain OCT devices are limited in their ability to scan the choroid. The choroid may now be readily seen in

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detail thanks to elevated depth imaging OCT (EDI-OCT).[3]

The primary objective of this study was to use OCT with improved depth of focus to identify variations in subfoveal choroidal thickness (SFCT) in posterior uveitis.

2. Patients and methods

Thirty patients with posterior uveitis who visited the ophthalmology divisions of Al-Azhar University Hospitals and Kobry El-Kobba Military Specialized Eye Hospital in Cairo, Egypt, participated in this prospective research.

Complete ophthalmological evaluation was done for all patients who included: complete history taking and medical checkup when needed. History: information about the patient (age, sex, place of employment, diabetes, and other chronic diseases), as well as their surgical and ophthalmic histories, and complete clinical ophthalmological examination. Visual acuity: the unassisted, best corrected visual acuity (BCVA), represented as (logMAR). Slit lamp analysis intra ocular pressure (IOP) is measured using application tonometry during a dilated fundus evaluation utilizing an indirect ophthalmoscope and slit lamp biomicroscopy for the evaluation of the macula, optic nerve, and retinal periphery. Investigations: OCT with enhanced depth of focus and fluorescein angiography (FFA).

2.1. Inclusion criteria

All patients with posterior uveitis.

2.2. Exclusion criteria

Patients with mental and/or physical handicap preventing imaging, patients diagnosed with diabetis mellitus (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.

2.3. Data analysis

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

2.4. Ethical considerations

Before starting the interviews, all research participants gave their informed permission. The patient has the freedom to join or leave the trial at any moment. The patient has a right to full disclosure of all research information. Only the researchers should have access to any patient data or identities in the study.

3. Results

The median age was 50.03 ± 2.36 years and the bulk of the patients were women (60%) (Table 1).

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

50.0% of the patients showed anterior segment involvement (Table 3).

The mean BCVA, best corrected visual acuity was 0.2 ± 0.13 and mean IOP 15.87 ± 4.28 mmHg (Table 4).

The most prevalent finding was papillitis (60.0%) while Chorioretinitis was found in (56.7%), Choroiditis in (53.3%), retinal vasculitis in (43.3%) and retinitis was found in 30.0% (Table 5).

The mean SFCT, Subfoveal choroidal thickness was 432.47 ± 67.44 μm (Table 6).

4. Discussion

Young individuals are most often affected by uveitis, an inflammatory condition that affects the uvea, retina, retinal arteries, and vitreous body. 60%–80% of patients are between the ages of three and six, with the disease commonly manifesting between the ages of 35 and 45. There are other ways to categorize uveitis, but the International Uveitis Study Group's (IUSG) system is the most popular. It divides the condition into anterior, intermediate, posterior, and panuveitis depending on the anatomic location of the inflammation.[4]

OCT is a noncontact method that creates an *in vivo* cross-sectional picture of the retina using optical equivalents. OCT imaging has been widely used in ophthalmology during the last 15 years. OCT may be used to identify macular edema in its early stages. Additionally, EDI-OCT allows for qualitative and quantitative evaluations of the choroid as well as more comprehensive information on this layer. In

Table 1. Demographic data distribution among the studied patients.

Variable	Patients (n = 30)
Age (years)	
Mean ± SD	50.03 ± 2.36
Sex	
Female	18 (60%)
Male	12 (40%)

Table 2. Posterior uveitis causes distribution among the studied patients.

	Patients (n = 30)
Non-Infectious	
Idiopathic	5 (16.7%)
Behçet	7 (23.3%)
Vogt Koyanagi–Harada disease (VKH)	6 (20%)
Multifocal choroiditis (MFC)	4 (13.3%)
Birdshot chorioretinopathy (BSCR)	2 (6.7%)
NonInfectious	
Herpes virus	2 (6.7%)
Toxoplasma	4 (13.3%)

Table 3. Anterior segment involvement distribution among the studied patients.

	Patients (n = 30)
Yes	15 (50.0%)
No	15 (50.0%)

order to assess CT in a number of disorders, such as diabetic retinopathy, higher myopia, and age-related macular degeneration, EDI-OCT has been employed. Uveitis has a complicated cause, and several clinical symptoms might occur. EDI-OCT provides the necessary information to better understand alterations in retinal and choroidal microstructures both in disease progression and inactivity Aumann et al.[5]

The main aim of this research was to detect the changes in SFCT in posterior uveitis utilizing OCT with enhanced depth of focus.

The mean age was 50.03 ± 2.36 years and most of the patients were females (60%).

The present study showed that most of the patients had unilateral posterior uveitis and 40% were bilateral. The major cause was Behçet disease (23.3) followed by Vogt-Koyanagi–Harada (VKH) disease (20%). Moreover, 80% of the patients were due to noninfectious causes and 20% of the patients were due to infectious causes.

Our findings were corroborated by Bozali et al.,[6] as they revealed that the right eye of four patients (13.3%), the left eye of five patients (%16.6) were involved leading to unilateral ocular involvement in 18 patients (60%) in total. 12 patients (40%) had bilateral ocular involvement.

Whereas in the study of Fabro and Herbort,[7] Eight recently diagnosed birdshot retinochoroiditis (BRC) patients (16 eyes) and six recently diagnosed VKH patients were among the 1872 uveitis patients examined between 1995 and 2016 (12 eyes).

Table 4. Best corrected visual acuity and intra ocular pressure among the studied patients.

	Patients (n = 30)
BCVA	
Mean ± SD	0.2 ± 0.13
IOP (mmHg)	
Mean ± SD	15.87 ± 4.28

Table 5. Main fundus changes distribution among the studied patients.

	Patients (n = 30)
Chorioretinitis	17 (56.7%)
Choroiditis	16 (53.3%)
Retinitis	9 (30.0%)
Retinal vasculitis	13 (43.3%)
Papillitis	18 (60.0%)

In contrary to our results study of Engelhard et al.,[8] as they revealed that Toxoplasma uveitis (n = 11, 17.74%), multifocal choroiditis (n = 9, 14.52%), nonspecific posterior uveitis (n = 9, 14.52%), and birdshot chorioretinitis (n = 7, 11.29%) were the most frequently diagnosed posterior uveitis diagnosis.

The current study showed that only 50% of the patients showed anterior segment involvement. The mean BCVA was 0.2 ± 0.13 and mean IOP 15.87 ± 4.28 mmHg.

Khairallah et al.,[9] revealed that although the patients were not followed up after remission, optical coherence topography angiography (OCTA) had a considerably greater sensitivity in identifying retinal microvascular alterations in active BU than the gold standard FFA. Similar to this, Accorinti et al.[10] observed that there are substantial variations in several parameters between eyes with active BU and those in a quiescent stage in OCTA research that compared the two groups of eyes.

In the study in our hands, as regard the main fundus changes distribution among the studied patients; the most prevalent finding was Chorioretinitis (56.7%) while choroiditis was found in 53.3% and retinitis was found in 30%. Retinal vasculitis was found in 43.3% and papillitis was found in 60%.

Whereas in the study of Wassef et al.,[11] retinitis was found in 31% of their studied group and vasculitis was found in 62% of them.

Since 1979, choroidal thickness measurements utilizing various techniques and tools, including ultrasonography and OCT, have been reported in a variety of illnesses. Choroidal thickness (ChT) is now recognized as a critical imaging biomarker for

Table 6. Subfoveal choroidal thickness among the studied patients.

	Patients (n = 30)
SFCT (μm)	
Mean ± SD	432.47 ± 67.44
Range	335–553

both choroidal and retinal diseases. Grasp the conventional way to assess ChT motivates us to have a thorough understanding of the etiology of these illnesses. Inflammation of the retina, choroid, and nearby tissues such the vitreous, optic nerve head, and retinal arteries may all occur in posterior uveitis Zhang and colleagues.[12]

Our results showed that as regard SFCT among the studied patients; the mean SFCT was 432.47 ± 67.44 μm.

In the study of Yan et al.,[13] the subfovea had the thickest CT on average, which was thinner nasally and thicker temporally. The uveitis group's average subfoveal CT was significantly smaller than the normal group's (229.9 ± 85.4 m vs. 276.5 ± 74.1 μm, respectively; $P < 0.001$), and the two groups' CTs at the other 10 study sites likewise differed significantly.

Maruko et al.,[14] eight individuals with VKH illness had 16 of their eyes investigated, and the results indicated that patients with active VKH displayed choroid thickness and that CT swiftly diminished with corticosteroid therapy. In another research, da Silva et al.,[15] eight individuals with VKH illness had 16 of their eyes investigated, and the results indicated that patients with active VKH displayed choroid thickness and that CT swiftly diminished with corticosteroid therapy.

In addition, Kim et al.,[16] stated that the difference in the median SFCT in the acute and quiescent phases of Behcet's uveitis (398.77 ± 155.59 vs. 356.72 ± 141.09 μm; $P = 0.004$) was statistically substantial. Additionally, there was a substantial difference between the quiescent phase's SFCT and the healthy population (259.96 ± 65.16 μm; $P < 0.0001$). It was also shown that individuals with unilateral Behcet's uveitis had SFCT that was considerably higher than that of the general population ($n = 13$ eyes; $P = 0.001$). Similarly, the study of Coskun et al.,[17] which comprising 30 healthy controls, 35 patients without ocular involvement from BD, and 35 patients with posterior uveitis due to BD, showed that patients with BD-related panveitis had subfoveal choroidal tissue atrophy.

However, in the research of Wassef et al.,[11] 20 patients and 26 eyes were included. Capillary density in both layers rose with the disappearance of active posterior uveitis, with the superficial capillary plexus (SCP) recording the sole considerable rise at 1.81 ± 3.57% ($P = 0.025$).

According to Chung et al.,[18] there were 46 eyes in 24 patients in the non uveitic patients with BD (NUBD) group, 16 eyes in 11 patients in the group with Behçet uveitis in an inactive state inactive uveitic behcet disease (IUBD), and 35 eyes in 23 patients in the control group. These groups had substantially different mean SFCT. The NUBD group's choroidal thickness (310.5 ± 81.0 μm) was considerably higher than that of the IUBD group (263.1 ± 56.6 μm, $P = 0.013$), and control group (256.9 ± 67.9 μm, $P = 0.002$). In comparison to the IUBD group, the NUBD group's disease activity score was considerably greater ($P < 0.001$).

Moreover, Bozali et al.,[6] revealed that mean foveal thickness in patients with BD was 216.06 ± 53.14 μm and mean SFCT was 363.21 ± 85.22 μm. Mean foveal thickness and SFCT 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 SFCT.

Agarwal et al.,[19] demonstrated that during the second follow-up, with the healing of the lesions, there was a substantial 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 in comparison to patients without OBD, patients with OBD had a substantially greater median SFCT (364.17 ± 93.34 vs. 320.43 ± 56.70 μm; $P = 0.008$). There was no statistically substantial variation in the median SFCT between the active and quiescent states (368.12 ± 104.591 vs. 354.57 ± 58.701 μm, $P = 0.579$).

4.1. Conclusion

Increased choroidal thickness may be a sign of underlying inflammation in the choroid and retina during the quiescent period. A fascinating metric that may be used to identify various disease entities, track the remission of inflammatory illnesses in the posterior pole, and assess the effectiveness of therapy is choroidal thickness. In this respect, EDI-OCT may add agreat deal of information in management and follow up inflammatory process of retina and choroid in posterior uveitis.

Conflict of interest

None declared.

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