Journal of Advances in Medicine and Medical Research

Volume 35, Issue 3, Page 8-13, 2023; Article no.JAMMR.95707
ISSN: 2456-8899
(Past name: British Journal of Medicine and Medical Research, Past ISSN: 2231-0614, NLM ID: 101570965)

Assessment of Choroidal and Central Foveal Thickness in Cases of Acute Anterior Uveitis Using Optical Coherence Tomography

Layla Al-sayed Mahfouz [a*], Mamdouh Mahmoud Kabil [a], Mona Samir Elkodousy [a] and Tamer Elsayed Wasfy [a]

[a] *Ophthalmology Department, Faculty of Medicine, Tanta University, Egypt.*

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/JAMMR/2023/v35i34948

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/95707

Original Research Article

Received: 22/11/2022
Accepted: 26/01/2023
Published: 04/02/2023

ABSTRACT

Background: The most typical ocular inflammatory condition is anterior uveitis, which frequently results in a painful red eye. Acute, subacute, or chronic manifestations are possible [1]. Acute anterior uveitis (AAU) can develop as a localized infection or as a standalone medical condition unrelated to any other illness or inflammation in the body. Most instances of acute unilateral, anterior non-granulomatous uveitis do not require an extensive work up because up to 50% of these patients are idiopathic [2]. When the uveitis is recurrent, chronic, bilateral, granulomatous, resistant to treatment, intermediate, posterior, or in children under the age of 15, laboratory testing should be taken into consideration. The majority of patients with acute unilateral, anterior non-granulomatous uveitis do not require a full workup because up to 50% of these patients are idiopathic [3].

**Corresponding author;*

Aim of the Study: Using optical coherence tomography and improved depth imaging, this controlled, selected, cross-sectional investigation evaluated the thickness of the choroidal and central foveal choroidal tissues in instances of acute anterior uveitis.
Patients and Methods: The study included 50 eyes from 25 patients with acute anterior uveitis, including 5 patients who had bilateral illness, and 20 eyes from 10 healthy, age-, gender-, and refraction-matched controls.
Results: The mean age of the patients 24 years (range 10 to 38 years) and of the controls was 22 years (range 13 to 40 years).This study was conducted on 25 patients: 17 male (68%) and 8 females (32%) and on 20 control participants: 5 males (50%) and 5 females (50. Best corrected visual acuity (BCVA) was measured in all participants using decimal notation and the mean (0.425± 0.213) was mildly decreased. All patients had a full ophthalmological examination, fundus examination, and macula OCT imaging with assessment of central foveal thickness and sub-foveal choroidal thickness, which we documented. The active acute anterior uveitis in the scanned eyes displayed cell densities ranging from +1 to +3 in the anterior chamber. All participants underwent spectral domain-OCT with enhanced depth imaging, and we discovered that in acute anterior uveitis, the central foveal thickness and the sub-foveal choroidal thickness increase in the affected eye and, to a lesser extent, in the other eye that appears to be healthy, compared to the eyes of completely normal people.
Conclusion: Comparing the eyes of patients with acute anterior uveitis to the fellow eyes of the patients, both the central foveal thickness and the sub-foveal choroidal thickness rise markedly.

Keywords: Sub-foveal choroidal thickness; central foveal thickness; anterior Uveitis; optical coherence tomography.

1. INTRODUCTION

One of the main reasons for avoidable blindness in the world is uveitis. According to the standardization of uveitis nomenclature (SUN) and international uveitis study group (IUSG) classification, it has been divided into a number of subgroups. Depending on where the primary location of inflammation is, the uveitis may be anterior, middle, posterior, or a pan-uveitis. Depending on the aetiology, it could also be categorized as infectious, noninfectious, or masquerading. However, the reason for many instances is yet unknown (idiopathic uveitis) [4].

Cells that are discernible in the anterior chamber upon examination serve as a defining characteristic of anterior uveitis. One of the most typical forms of ocular inflammation that eye care professionals will face is anterior uveitis. It could show signs of being acute, subacute, or chronic. The term "anterior uveitis" refers to any infection of the anterior ciliary body, the iris, or both (iridocyclitis) [1].

Because up to 50% of patients with acute unilateral, anterior non-granulomatous uveitis are idiopathic, most cases don't require a full workup. Laboratory testing should be considered when the uveitis is recurrent, chronic, bilateral, granulomatous, refractory to therapy, intermediate, posterior, or in children under the age of 15 [3].

Optical coherence tomography (OCT), or "optical biopsy," offers millimeter penetration with submicrometric axial and lateral resolution and is based on the low-coherence in terferometry theory. The pathophysiology of these structures can be determined using OCT's quantitative and qualitative evaluation of the retinal and choroidal architecture, and the resulting data can be displayed as a false-color topographic map [5].

Spectrometer-based (SB) and swept source OCT are the two primary OCT techniques. Conventional time domain OCT (TD-OCT) and Fourier domain / spectral domain OCT (FD/SD-OCT) are also used (SS). To produce cross-sectional images, SD-OCT collects detailed information from a variety of retinal structures. However, it only gives a limited picture of the choroid's makeup and how it works. This is mostly caused by signal loss and light scattering at the highly reflecting RPE layer, which obstructs the majority of signals from the choroid. Choroidal vasculature and thickness can be assessed quantitatively and qualitatively using enhanced depth imaging (EDI) [6].

2. METERIALS AND METHODS

This controlled, selective, cross-sectional study was carried out on 50 eyes of 25 patients with acute anterior uveitis – with 5 patients with

bilateral affection - presented to Ophthalmology outpatient clinic in Tanta University Hospitals from February 2021 to January 2022. results were compared to 20 eyes of 10 normal age/sex/refraction-matched subjects not suffering from any other ocular or systemic disease.

2.1 Inclusion Criteria

Any patient with acute anterior uveitis who has just received a clinical diagnosis.

2.2 Exclusion Criteria

1. Patients who have extensive cataracts or any other media opacity that prevents clear imaging or prevents a thorough clinical examination.
2. Patients with panuveitis, posterior uveitis, pars planitis, and vitritis.
3. People who already have macular disorders (e.g., epiretinal membrane, macular hole, or age-related macular degeneration).
4. Individuals who had intraocular surgery within six months of their diagnosis.
5. People who have high myopia (>6 diopters).

2.3 Statistical Analysis

With the help of IBM's Statistical Package for Social Sciences (SPSS), Version 25.0, the data were sorted and analyzed. IBM Corp., Armonk, New York
Number and percentage were used to describe the qualitative data.
Mean and standard deviation were used to present quantitative data (SD).
Categorical variables were analyzed using the Chi-square test.
T-test was used to analyze the means of quantitative data.

To examine the variations in group means, analysis of variance (ANOVA) was utilized.

3. RESULTS

This study involved 50 eyes of 25 patients with acute anterior uveitis who visited Tanta University Hospitals' ophthalmology outpatient clinic between February 2021 and January 2022; 5 of these patients had bilateral involvement. The results were compared to 20 normal eyes from 10 healthy volunteers who were of similar age, sex, and refraction and had no additional ocular or systemic illnesses.

They were distributed into group A (AAU- 30 affected eyes), B (20 unaffected fellow eyes), and C (20 healthy control eyes).
Affected eyes - group A - included 25 patients with heterogenous etiologies (6 cases with acute granulomatous uveitis following swimming in brackish water, 2 cases with juvenile rheumatoid arthritis, and 17 idiopathic cases).

Majority of examined patients (53.33%) had +1 cell density at time of examination.
Measurements of those groups were compared and analyzed, the following results were found;

- Central foveal thickness in group A was found to be markedly increased than both group B and C.
- Central foveal thickness in group B was found to be higher than group C and less than group A.
- Statistically significant correlation were found in comparison between groups (A-C), (B-C) and (A-B)

Table 1. Central foveal thickness

Central foveal thickness	Groups								
	Group A			Group B			Group C		
Range	272	-	406	200	-	285	190	-	226
Mean ±SD	379.233	±	29.722	225.800	±	26.155	203.600	±	10.894

Table 2. Data statistics

ANOVA		TUKEY'S Test		
F	P-value	A&B	A&C	B&C
384.419	<0.001*	<0.001*	<0.001*	0.016*

Table 3. Sub-foveal Choroidal thickness

Sub-foveal Choroidal thickness	Groups								
	Group A			Group B			Group C		
Range	222	-	598	264	-	437	146	-	373
Mean ±SD	401.767	±	90.368	360.500	±	52.309	246.850	±	58.274

Table 4. Data statistics

ANOVA		TUKEY'S Test		
F	P-value	A&B	A&C	B&C
27.885	<0.001*	0.128	<0.001*	<0.001*

Sub-foveal choroidal thickness measurement was conducted to the three main groups in the study by OCT.

Measurements of those groups were compared and analyzed, the following results were found;

- Sub-foveal choroidal thickness in group A was observed to be markedly increased than both group B and C.
- Sub-foveal choroidal thickness in group B was observed to be higher than group C and less than group A.
- Statistically significant correlation were found in comparison between groups (A-C) and groups (B-C).

4. DISCUSSION

In this cross-sectional study, we measured central foveal thickness and sub-foveal choroidal thickness using optical coherence tomography (Spectralis) with enhanced depth imaging in order to explore foveal and choroidal subclinical changes that aren't frequently taken into account in the evaluation of acute anterior uveitis cases.

Thirty eyes with acute anterior uveitis for twenty five patients, were imaged in this study, represented in group A. Twenty healthy fellow eyes of the twenty five patients were imaged representing group B. And 20 healthy eyes of ten healthy individuals are representing group C.

In comparative studies in the literatures, authors had different perspectives in dividing their groups. Some like Kim et al; [7] -who followed a similar methodology to that study -divided the studied groups into group 1 (AAU-affected eyes), 2 (unaffected fellow eyes), and 3 (healthy control eyes).

Others as Lee et al; [8] included two groups: the diseased eyes in addition to the healthy control eyes. A different methodology, however, was applicated by Balaskas et al; [9] and Thapa et al. [10] who considered the healthy fellow eyes as the control group.

Regarding sub-foveal choroidal thickness, significant increase was detected compared to the control group ($p < 0.001$*)

Interestingly fellow eyes also stated a significant rise in the thickness of sub-foveal choroid in comparison to control groups (group C) ($p < 0.001$*)

Kim et al.; [7] as well reported a statistically significant difference between the diseased eye and the control group in terms of the sub-foveal choroidal thickness (P.001). The sub-foveal choroidal thickness across groups 2 and 3 did not differ significantly from one another, though (P =.998).

Also supported by Thapa et al. [10] Comparing diseased eyes to their peer eyes, the mean sub-foveal choroidal thickness in the diseased eyes increased statistically significantly (P 0.001).

Regarding central foveal thickness, there was a substantial increase in the diseased eyes' central foveal thickness when compared to the control group (P 0.001*).

However, the current study also found that the damaged eyes' central foveal thickness was statistically significantly higher than that of the unaffected, healthy eyes (P=0.025).

Kim et al. [7] indicated that group 1 had a significantly greater central foveal thickness than groups 2 and 3 did during the acute stage of uveitis (P =.041 and P =.013, respectively). However, there was no discernible difference in

central foveal thickness between groups 2 and 3 (P =.998).

Lee et al. [11] as well agreed with the former results; The central macular thickness of affected eyes considerably increased in contrast to other eyes during the active phase (p = 0.047), demonstrating that all areas of the macula in affected eyes were thicker than those in unaffected eyes.

Lee did point out that the macular thickness decreases in the following period to a degree comparable to that of the opposite eye during the inactive phase [11].

The link between anterior chamber cell grade, sub-foveal choroidal thickness, and central foveal thickness has been the subject of inconsistent conclusions in the literature.

In this study, a positive correlation which was reported to be clinically significant between the density of anterior chamber cells and the thickness of the sub-foveal choroidal tissue was discovered. (P<0.001)

Similar to Thapa et al. [10] who observed that the disease severity increases based on AC reaction, the sub-foveal choroidal thickness clearly begins to increase from normal range of 200–300 μm which signifies a moderate association. Central foveal thickness wasn't discussed in Thapa's paper.

Whereas For Kim et al. [7] no significant association was found neither with sub-foveal choroidal thickness (P = 0.273) nor central foveal thickness (P= 0.436).

Meanwhile Lee et al; found that the degree of anterior chamber inflammation had no significant effect on the initial central macular and average ganglion cell - inner plexiform thicknesses. In the subsequent investigation, sub-foveal choroidal thickness was not covered [8].

As regards the relation between sub-foveal choroidal thickness and central foveal thickness, no clinically significant correlation could be built. A similar result was reached by Kim et al. [7] where they didn't report any significant correlation among choroidal and retinal thicknesses in the three participating groups (P = 0.235 [group 1], P = 0.695 [group 2]; and, P = 0.051 [group 3]).

5. CONCLUSION

OCT findings revealed that central foveal thickness and sub-foveal choroidal thickness show significant increase in comparison to healthy eyes. And fellow unaffected eyes also show significant rise in central foveal thickness in addition to sub-foveal choroidal thickness in comparison to healthy eyes.

CONSENT

As per international standard or university standard, patient(s) written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Nickla DL, Wallman J. the multifunctional choroid. prog retin eye res. 2010 Mar;29(2):144.
2. Simmons-Rear A, Yeh S, Chan-Kai BT, Lauer AK, et al; characterization of serous retinal detachments in uveitis patients with optical coherence tomography. journal of ophthalmic inflammation and infection. 2012;2(4):191.
3. Jabs DA, Nussenblatt RB, Rosenbaum JT; Standardization of Uveitis Nomenclature (SUN) Working Group. Standardization of uveitis nomenclature for reporting clinical data. Results of the First International Workshop. Am J Ophthalmol. 2005;140(3): 509-16.
4. Choi RY, Rivera-grana E, Rosenbaum JT. Reclassifying Idiopathic Uveitis: Lessons from a Tertiary Uveitis Center. Am J Ophthalmol. 2019;198:193–9.
5. Nazari H, Rao N. Recent Advances in Ocular Imaging in Management of Uveitis and Related Intraocular Inflammations. Advances in Ophthalmology and Optometry. 2017;2(1):435-57.
6. Kim JS, Knickelbein JE, Jaworski L, Kaushal P, Vitale S, Nussenblatt RB, *et al*. Enhanced Depth Imaging Optical Coherence Tomography in Uveitis: An

Intravisit and Interobserver Reproducibility Study. Am J Ophthalmol. 2016;164: 49–56.

7. Kim M, Choi SY, Park YH. analysis of choroidal and central foveal thicknesses in acute anterior uveitis by enhanced-depth imaging optical coherence tomography. BMC ophthalmology. 2017[Cited 2022 May 15];17(1):1–7.
8. Margolis R, Spaide RF. a pilot study of enhanced depth imaging optical coherence tomography of the choroid in normal eyes. Am J Ophthalmol. 2009;147(5):811–5.
9. Manjunath V, Taha M, Fujimoto JG, Duker JS. Choroidal thickness in normal eyes measured using Cirrus HD optical coherence tomography. Am J Ophthalmol. 2010;150(3).
10. Sezer T, Altınışık M, Koytak İA, et al; the choroid and optical coherence tomography. turk oftalmoloiji Dergisi. 2016;46(1):30–7.
11. Lee MW, Lee TH, Won YK, et al; characteristics of retinal layer thickness in acute anterior uveitis: an optical coherence tomography study. acta ophthalmol. 2020[Cited 2022 May 15];98(1):e50–5.

Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/95707