The Egyptian Journal of Hospital Medicine (July 2025) Vol. 100, Page 3498-3506

Role of Anterior Segment Optical Coherence Tomography in Assessment of Anterior Uveitis in Behçet's Disease

Sawsan Abd Elsabour Shalaby, Rasha Mohammad Rashed, Asmaa Ismail Ali Selim*
Department of Ophthalmology, Faculty of Medicine for Girls, Al-Azhar University
***Corresponding author:** Asmaa Ismail Ali Selim, **Mobile:** +21010364609, **E-Mail:** asmaaismail355@gmail.com

ABSTRACT

Background: Behçet's disease (BD) is a chronic autoimmune vasculitis that affects multiple organ systems. Although its precise etiology remains elusive, it manifests with a diverse spectrum of clinical presentations.

Aim of the work: This study's primary objective was to assess anterior segment ocular findings in patients presenting with anterior uveitis associated with Behçet's disease, utilizing Anterior Segment Optical Coherence Tomography (AS-OCT).

Patients and methods: This prospective, cross-sectional study was conducted at Al-Zahraa University Hospital, involving the Rheumatology and Ophthalmology Departments. It included 20 patients (40 eyes) diagnosed with BD (group A) and 20 healthy controls (40 eyes) (group B).

Results: A highly significant difference ($p < 0.01$) was observed in visual acuity (VA) and best-corrected visual acuity (BCVA) between group A and group B. Group A exhibited significantly lower mean VA (0.22 ± 0.10) and BCVA (0.06 ± 0.04) compared to group B (0.06 ± 0.05 and 0.02 ± 0.02 respectively) indicating superior visual function in controls. AS-OCT findings, particularly pachymetry measurements, also showed a highly significant difference ($p < 0.01$) in central pachymetry between groups. Group A had a significantly lower mean central pachymetry (522.8 ± 11.5 µm) than group B (532.2 ± 5.1 µm), suggesting potential corneal thinning in BD-associated uveitis.

Conclusion: This study underscored significant ocular alterations linked to Behçet's disease in patients with anterior uveitis, specifically identifying corneal thinning (indicated by lower central pachymetry) and reduced visual acuity.

Keywords: Anterior segment optical coherence tomography, Anterior uveitis, Behcet's disease.

INTRODUCTION

Behçet's disease (BD) stands as a complex, chronic systemic inflammatory condition, the precise origins of which remain largely undetermined. Its diagnostic histopathological hallmark is a distinctive occlusive vasculitis, a unique inflammatory process that can compromise blood vessels of varying calibers throughout the body, with a particular predilection for veins. Clinically, BD manifests through a constellation of recurrent and often debilitating symptoms, notably painful oral and genital ulcers, significant ocular inflammatory involvement (such as uveitis), diverse cutaneous lesions, and widespread vascular involvement that can affect arteries and veins, alongside potential inflammatory infiltration of virtually any other organ system [(1)]. This broad spectrum of clinical presentation underscores the systemic and multifaceted nature of the disease.

Research consistently indicates that an elevation in various immunological markers, including increased immunoglobulins, circulating immunocomplexes, and acute phase proteins, is strongly implicated in driving the diverse clinical manifestations observed in BD, particularly its challenging ocular complications. A multitude of proinflammatory and inflammatory cytokines, pivotal mediators of the immune response, have been shown to be significantly upregulated during the active phases of BD and in co-occurring conditions like keratoconus (KC), a progressive thinning of the cornea. Notably, interleukin (IL)-6, a pleiotropic cytokine, demonstrates elevated levels not only during the active periods of BD but also in its quiescent phases, and is similarly increased in KC [(2)]. Given the understanding that heightened proinflammatory mediators are considered primary drivers of the

structural changes observed in the cornea during KC, it was logically hypothesized that these same inflammatory mediators could similarly induce adverse structural and functional alterations within the anterior segment of the eye in patients afflicted with BD [(2)].

The persistent nature of chronic and severe intraocular inflammation characteristic of BD frequently culminates in the development of severe ocular complications, most notably glaucoma (a condition damaging the optic nerve) and cataract formation (clouding of the eye's natural lens). Consequently, patients presenting with uveitic eyes, particularly those with a history of recurrent or severe inflammation, face a substantially elevated risk of requiring complex intraocular surgical interventions. When these uveitic eyes also exhibit corneal endothelial damage, the challenges associated with intraocular surgery become even more pronounced. The presence of posterior synechiae (adhesions between the iris and lens), a small pupil that limits surgical access, and fragile zonules (structures supporting the lens) further compound the surgical complexity, demanding exceptional surgical skill and meticulous pre-operative planning [(3)].

Observations from several investigators have consistently reported alterations in corneal thickness (CT) in patients with uveitis secondary to BD. These studies indicate a clear tendency for CT to increase significantly during an acute inflammatory attack affecting the anterior uvea, with a subsequent reduction in thickness observed upon initiation of effective treatment for the anterior uveitis. Laboratory

Received: 24/03/2025
Accepted: 22/05/2025

investigations provide compelling mechanistic insights, suggesting that intraocular inflammatory reactions, precisely mediated by various inflammatory cytokines present within the aqueous humor, are directly responsible for inducing these observed corneal structural changes in uveitic eyes [3]. These cytokines likely disrupt the delicate fluid balance and cellular integrity of the cornea, leading to edema and thickening.

Anterior Segment Optical Coherence Tomography (AS OCT) represents a transformative advancement in ophthalmic imaging technology. This non-invasive diagnostic modality achieves superior tissue penetration and facilitates remarkably detailed, cross-sectional visualization of the intricate internal configurations of anterior segment tissues. This enhanced imaging capability has profoundly improved the precision and utility of quantitative clinical measurements across numerous ocular conditions. With its sophisticated features tailored for imaging a broad range of anterior segment structures, including the conjunctiva, cornea (including its layers), sclera, the entire anterior chamber (encompassing its angles and depth), iris, ciliary body, and lens, AS OCT has firmly established itself as an indispensable first-line, non-contact examination tool in modern ophthalmological practice [4]. Its ability to provide high-resolution, objective data on these structures revolutionizes early detection, diagnosis, and monitoring of anterior segment pathologies.

Aim of the work: The primary objective of this study was to comprehensively assess the anterior segment findings in patients presenting with anterior uveitis specifically that attributed to Behcet's disease. This evaluation will encompass key parameters such as pachymetry (corneal thickness measurement) and the anterior chamber angle. The assessment will be conducted through a multi-modal approach, integrating both conventional clinical examination techniques and the advanced, high-resolution imaging capabilities offered by Anterior Segment Optical Coherence Tomography (AS OCT) technology.

PATIENTS AND METHODS

This investigation employed a **prospective and non-randomized cross-sectional study design**, allowing for the collection of data at a single point in time from distinct groups while tracking them forward for specific outcomes. The study was conducted over a defined period, commencing in July 2024 and concluding in January 2025. All research activities were carried out collaboratively across the Rheumatology and Ophthalmology Departments of Al-Zahraa University Hospital, which is affiliated with Al-Azhar University.
The study cohort comprised a total of 40 patients, who were systematically divided into two distinct groups. **Group (A)** consisted of 20 patients, contributing 40 eyes for analysis. These participants were individuals aged 18 years or older who were diagnosed as Behcet's disease and were attending the Rheumatology clinic and internal medicine immunology unit for routine follow-up care. **Group (B)** served as the healthy control group, also comprising 20 individuals, contributing 40 eyes. These control participants were healthy individuals carefully matched for the same age range as group A, and importantly, had no history of Behcet's disease or any other systemic or significant ocular pathology, ensuring a robust comparison.

Inclusion criteria: This study included patients of either gender that diagnosed as Behcet`s disease with anterior uveitis. Age >18 years old.
Exclusion criteria: Ocular or systemic diseases other than Behcet's disease. Previous intraocular surgery or trauma.
All patients participating in this study underwent a comprehensive evaluation process encompassing a detailed history, a thorough ophthalmological examination, and specialized investigations.

Full history taking: A comprehensive patient history was meticulously obtained from each participant. This began with a personal history section, collecting essential demographic data including their name and age. Subsequently, a highly detailed medical history of Behcet's disease was recorded, focusing on its precise onset, duration, and any past or current drug intake related to the condition. Similarly, a specific history of anterior uveitis was documented, noting its onset, duration, and any relevant medication use. Furthermore, the history taking explored the presence of any associated systemic diseases, such as diabetes mellitus (DM) or hypertension (HTN), which could influence ocular health or disease progression. Finally, any history of ocular trauma or surgical interventions within the preceding six months was carefully ascertained, as these factors could potentially confound the study's findings or affect ocular integrity.

Complete ophthalmological examination: Each patient received a complete ophthalmological examination to objectively assess their ocular status. Uncorrected and best-corrected visual acuity (BCVA) were precisely measured using a Landolt's C chart. These measurements were then accurately converted to the LOG MAR scale to facilitate robust statistical analysis, providing a standardized metric of visual function. A detailed slit-lamp examination (utilizing a TOPCON slit lamp, Japan) was performed to thoroughly evaluate the anterior segment of the eye, inspecting structures like the conjunctiva, cornea, anterior chamber, iris, and lens for signs of inflammation or structural anomalies. Intraocular pressure (IOP) measurement was conducted using the Goldmann's applanation Tonometry (KEELER UK), a gold-standard method for detecting potential glaucoma or ocular hypertension. Finally, a thorough fundus examination of the posterior segment was carried out following full pupil dilatation, achieved with 1%

Tropicamide solution. This examination was performed using slit-lamp biomicroscopy in conjunction with a +90 D lens, enabling a clear view of the optic nerve, macula, and peripheral retina to identify any posterior segment complications.

Investigations including anterior segment OCT: Specialized investigations included Anterior Segment Optical Coherence Tomography (AS OCT). This advanced, non-invasive imaging modality offers high-resolution visualization of various critical features of the anterior segment. It allows for precise measurement of corneal thickness (CT), which can indicate corneal edema or other alterations. It also accurately determines anterior chamber (AC) depth, important for assessing glaucoma risk. AS OCT is invaluable for determining the extent of anterior or posterior synechiae (adhesions), evaluating iris bowing, and identifying subtle angle lesions, which are crucial for understanding anterior chamber dynamics. Beyond structural assessment, AS OCT serves as a non-invasive method for objectively assessing anterior uveitis and its complications, capable of detecting and quantifying features indicative of inflammation such as inflammatory cells within the aqueous humor, keratic precipitates on the corneal endothelium, fibrin exudates, and corneal edema. All AS OCT measurements were performed using the Avanti RTVue-XR platform (Optovue, Fremont, CA, USA) spectral domain OCT, specifically equipped with the add-on lens of the corneal adaptor module (CAM-L mode, S/N 43386) to optimize anterior segment imaging.

Ethical approval: The Institutional Ethics Committee approved this study that was formally granted by the Joint Rheumatology and Ophthalmology Departments of Al-Zahraa University Hospital Al-Azhar University. This research was conducted in accordance with the ethical principles for studies involving human subjects, as stipulated by The Code of Ethics of the World Medical Association, guidelines of Helsinki Declaration. This commitment ensures that all aspects of the study, from design to execution, uphold the highest standards of human participant protection and scientific integrity.

Statistical analysis

Data were statistically analysed utilizing SPSS version 27 (IBM©, Armonk, NY, USA). The normality of data was assessed using the Shapiro-Wilks test and visual inspection of histograms for appropriate statistical test selection. Normally distributed quantitative parametric data were presented as the mean ± SD and were analyzed using the unpaired Student's t-test for comparisons between two independent groups, and the paired t-test for comparisons within the same group (e.g., pre- and post-intervention measurements). Non-normally distributed quantitative non-parametric data were presented as the median and interquartile range (IQR). Mann-Whitney U test was used to compare between two independent groups of non-parametric data, while the Wilcoxon signed-rank test was used to compare within the same group. Qualitative variables were summarized using frequency and percentage (%). Associations between qualitative variables were assessed using the Chi-square test, or Fisher's exact test when sample sizes or expected cell counts were small. A two-tailed P value ≤ 0.05 was deemed significant. For assessing correlations, Pearson's correlation coefficient was used for normally distributed data, and Spearman's rank correlation coefficient was applied to abnormally distributed data, to determine the strength and direction of relationships between variables.

RESULTS

According to the comparison of demographic data between studied groups, it was found that there was non-significant difference between cases (Group A) and control (Group B) regarding age and gender (p value > 0.05), as the mean age of cases was 33.5 ± 4.5 years, ranged from 28 to 40 years compared to 33.8 ± 6.7 years, ranged from 24 to 44 years among control with 70% of cases were males compared to 60% of control (Table 1).

Table (1): Demographic data of studied groups

	Cases (Group A) (n=20)	**Control (Group B) (n=20)**	**P value**
Age			
Mean ± SD	33.5 ± 4.5	33.8 ± 6.7	0.78
Range	28-40	24-44	
Gender			
Male	14 (70%)	12 (60%)	0.50
Female	6 (30%)	8 (40%)	

P value >0.05: Non significant, SD: Standard deviation

By comparing visual acuity (VA) and best corrected visual acuity (BCVA) between cases (Group A) and control (Group B), the difference was highly significant (p value <0.01) as the mean Visual acuity and BCVA was significantly higher among cases (0.22 ± 0.10 and 0.06 ± 0.04 respectively) than among control (0.06 ± 0.05 and 0.02 ± 0.02 respectively) that mean VA and BCVA in control is better than cases. On the other hand, non-significant difference was found between cases and control regarding IOP (P value >0.001), however, the means were slightly higher among cases than control (Table 2).

Table (2): Comparison of VA and IOP between studied groups

		Cases (Group A) (n=40 eyes)	Control (Group B) (n=40 eyes)	P value
Visual acuity log mar	Mean ±SD Median Range	0.22±0.10 0.20 0.02-0.40	0.06±0.05 0.10 0- 0.20	<0.001*
BCVA	Mean ±SD Median Range	0.06±0.04 0.05 0-0.15	0.02±0.02 0 0- 0.10	<0.001*
IOP (mmHg)	Mean ±SD Median Range	13.25±1.90 13.50 10-17	12.8±1.6 12.5 10-16	>0.001

P value <0.001: Significant, P value >0.001: Non Significant.

By comparing central pachymetry between cases (Group A) and control (Group B), the difference was highly significant (p value <0.01) as the mean central pachymetry was significantly lower among cases (522.8 ± 11.5) than among control (532.2 ± 5.1). On other hand, non-significant difference was found between cases (Group A) and control (Group B) regarding peri-central pachymetry and paracentral pachymetry (p value > 0.05), however the means were slightly higher among cases than among control (Table 3).

Table (3): AS OCT findings (pachymetry) of studied groups

		Cases (Group A) (n=40 eyes)	Control (Group B) (n=40 eyes)	P value
Central pachymetry (µm)	Mean ± SD Median Range	522.8±11.5 518 507-550	532.2±5.1 534 522-540	**<0.001***
Peri-central pachymetry (µm)	Mean ±SD Median Range	564.1±37.4 550 523-665	560.6±13.3 558 540-602	**0.58**
Paracentral pachymetry (µm)	Mean ±SD Median Range	566.1±37.7 550 525-665	561.2±12.9 559 540-602	**0.44**

P value <0.001: Significant, P value >0.001: Non Significant, SD: standard deviation.

By comparing keratic precipitates and posterior synechia between cases (Group A) and control (Group B), the difference was significant (p value <0.05) as 12.5% of cases had keratic precipitates and 22.5% of cases had posterior synechia compared to none of control. On other hand, non-significant difference was found between cases (Group A) and control (Group B) regarding AC cell score and number of hyper-reflective spot in AS-OCT (p value > 0.05), however, 10% of cases had AC cell score +1, which had hyper-reflective spot in AS-OCT either 6, 7or 8 spots compared to none of control (Table 4).

Table (4): Comparison of AS OCT finding between studied groups

	Cases (Group A) (n=40 eyes)	Control (Group B) (n=40 eyes)	P value
Keratic precipitates			
No	35 (87.5%)	40 (100%)	0.02*
Yes	5 (12.5%)	0 (0%)	
Posterior synechia			
No	31 (77.5%)	40 (100%)	0.001*
Yes	9 (22.5%)	0 (0%)	
AC cell score			
Non	36 (90%)	40 (100%)	0.12
+1	4(10%)	0 (0%)	
Number of Hyper-reflective spot in AS-OCT			
0	36 (90%)	40 (100%)	
7	1(2.5%)	0 (0%)	0.24
8	1(2.5%)	0 (0%)	
6	1 (2.5%)	0 (0%)	
6	1 (2.5%)	0 (0%)	

P value < 0.05: Significant, P value > 0.05: Non Significant.

Regarding the comparison of AC angle between cases (Group A) and controls (Group B), which was measured using AS-OCT, the difference was statistically significant (P = 0.004), as the mean AC angle was higher among cases (38.70 ± 2.05) compared to controls (38.6 ± 3.35)**.**

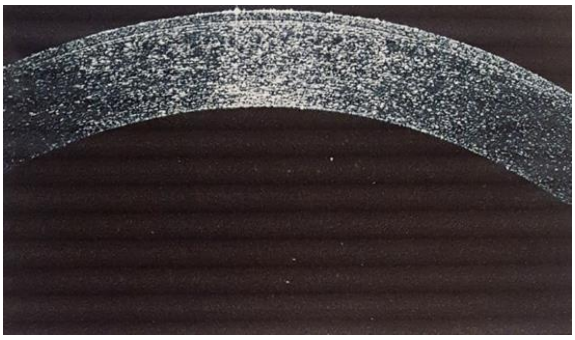
Table (5): Comparison of AC angle between studied groups

	Cases (Group A) (n=40 eyes)	**Control (Group B) (n=40 eyes)**	**P value**
AC angel			
Mean ±SD	38.70±2.05	38.6±3.35	**0.004**
Median	39.4	39	
Range	36.40-43.12	33-45	

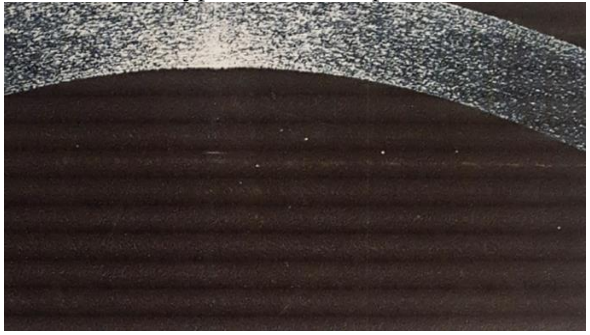
P value 0.05: Non Significant, SD: standard deviation.

Angle opening distance (AOD-500) and trabeculo–iris space area (TISA-500) are AS-OCT parameters used to assess the anterior chamber angle. AOD-500 measures the distance between the cornea and iris at 500 µm from the scleral spur, while TISA-500 measures the space area in that region.

In our study, both AOD-500 and TISA-500 values were slightly lower in cases (0.37 ± 0.06 mm and 0.19 ± 0.04 mm, respectively) compared to controls (0.39 ± 0.06 mm and 0.20 ± 0.06 mm), and this difference was statistically significant (P = 0.002 and P < 0.001, respectively). This suggests that Behcet uveitis may be associated with subtle narrowing of the anterior chamber angle as assessed by AOD-500 and TISA-500 in this study.



AS OCT right cornea and anterior chamber showing hyper reflective spots



AS OCT left cornea and anterior chamber showing hyper reflective spots

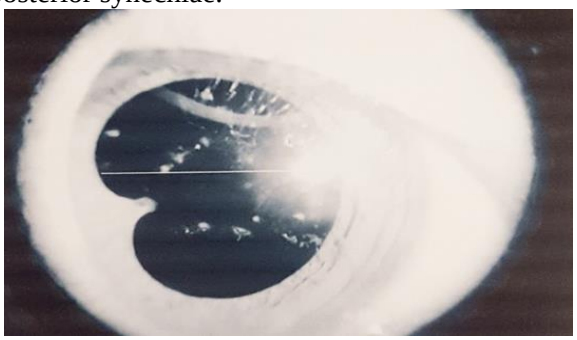
Table (6): Comparison of AOD-500 and TISA-500 between studied groups

	Cases (Group A) (n=40 eyes)	**Control (Group B) (n=40 eyes)**	**P value**
AOD-500 (µm)	0.37±0.06	0.39±0.06	**0.002**
Mean ± SD	0.36	0.39	
Median	0.20-0.49	0.30-0.50	
Range			
TISA-500 (mm^2)	0.19±0.04	0.20±0.06	> **0.001**
Mean ± SD	0.19	0.19	
Median	0.05-0.24	0.05-0.30	
Range			

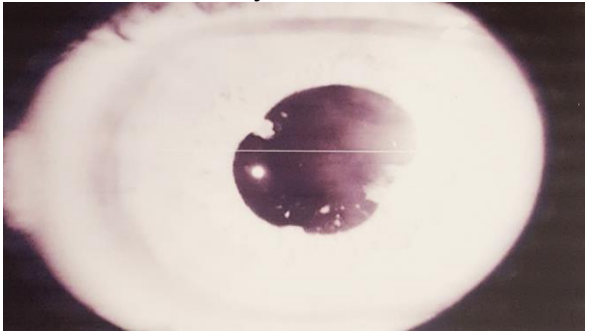
P value >0.05: Non Significant, SD: Standard deviation

CASE (1):

A 28-years-old male, diagnosed with Behcet's disease six years prior based on recurrent oral ulcers, genital ulcers, and skin lesions, presented with a three-day history of bilateral ocular redness, photophobia, and reduced vision. Ophthalmological examination revealed active anterior uveitis with +1 cells in both anterior chambers and bilateral posterior synechiae. Fundus examination showed mild retinal vessel tortuosity and scattered retinal hemorrhages. Anterior Segment Optical Coherence Tomography (AS OCT) confirmed the inflammation, demonstrating 7 hyperreflective spots in the right eye and 8 in the left (both scored +1), alongside the presence of bilateral posterior synechiae.



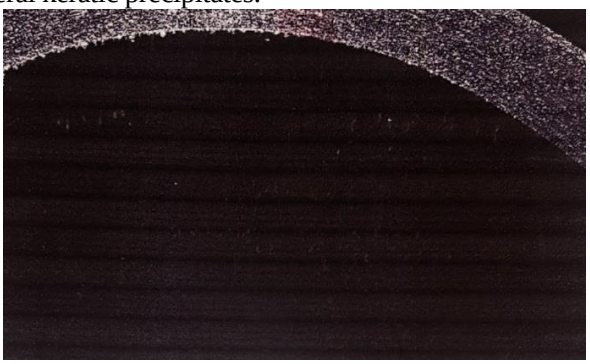
En face image of AS OCT right eye showing posterior synechia



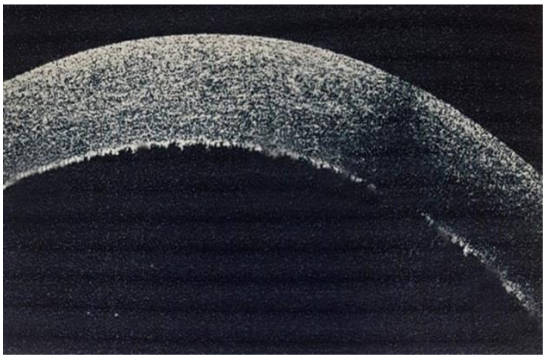
En face image of AS OCT left eye showing posterior synechia

CASE (2)

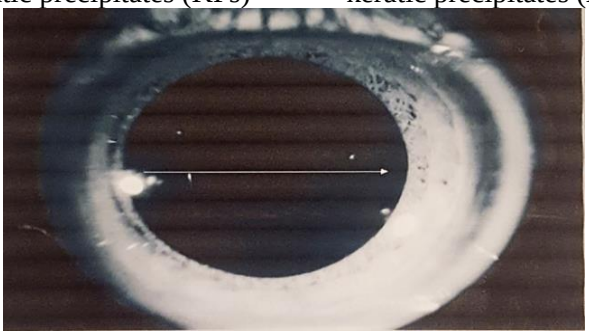
A 36-year-old male, diagnosed with Behcet's disease 20 years ago (history of recurrent oral and genital ulcers), presented with bilateral diminution of vision, photophobia, and lacrimation for one week. He reported prior similar attacks, with the last resolution 8 months ago following treatment. Ophthalmological examination revealed +1 anterior chamber cells bilaterally. Fundus examination showed attenuated vessels and a hyperemic optic disc. Anterior Segment Optical Coherence Tomography (AS OCT) identified 6 hyperreflective spots (score +1) in the right eye, 5 spots (score +1) in the left eye, and bilateral keratic precipitates.



AS OCT right cornea and anterior chamber showing hyper reflective spots and keratic precipitates (KPs)



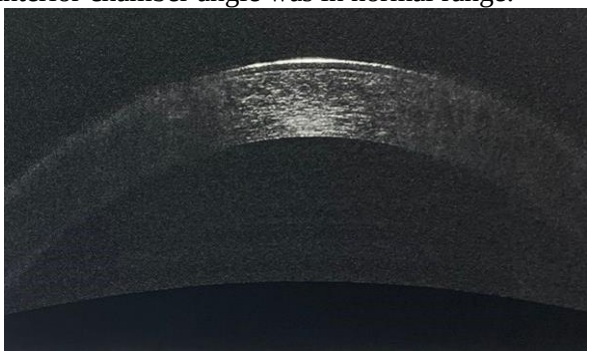
AS OCT left Cornea and anterior chamber showing keratic precipitates (KPs) and hyper reflective spot



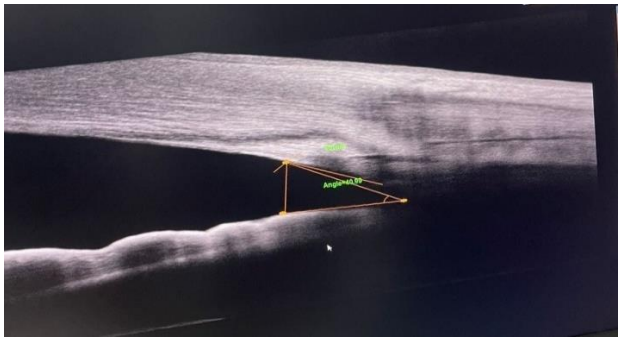
En face image of AS OCT right eye showing dilated pupil which is regular.

CASE (3)

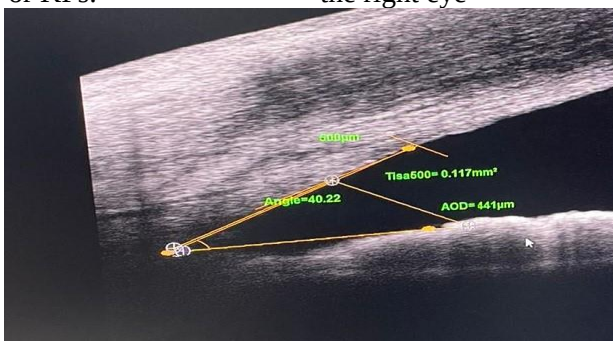
32 years old, female patient, coming for follow up. She was known as a case of Behcet's disease (BD) 5 years ago. On examination anterior and posterior segment showed no abnormality detected. Last attack of uveitis was 6 months ago and resolved after treatment. Anterior segment OCT (OCT) showed no AC cells, KPs or posterior synechia and anterior chamber angle was in normal range.



Anterior segment OCT showing no anterior chamber hyper reflective spots or KPs.



AS OCT showing nasal anterior chamber angle of the right eye



AS OCT showing temporal anterior chamber angle of right eye.

DISCUSSION

Behçet's disease (BD) is recognized as a chronic, systemic autoimmune vasculitic disorder, distinguished by inflammation of blood vessels that can impact virtually any organ system within the body. While its precise underlying etiology remains unelucidated, it presents with an exceptionally broad and varied spectrum of clinical manifestations, making diagnosis and management complex [(5)]. This multifactorial nature contributes to its challenging clinical course.

While BD is fundamentally considered as the classical triad of repetitive oral aphthous ulcers, painful genital ulcers, and chronic, relapsing uveitis affecting the eye, its systemic reach extends much further. Patients commonly develop additional manifestations such as superficial thrombophlebitis (inflammation of veins close to the skin surface), arthritis (joint inflammation), erythema nodosum (painful red nodules typically on the shins), significant gastrointestinal involvement (leading to abdominal pain and ulceration), deep vein thrombosis (formation of blood clots in deep veins), and potentially severe neurological complications affecting the central or peripheral nervous systems [(6)]. The unpredictable progression and diverse presentation underscore the challenging nature of this systemic disease.

Anterior Segment Optical Coherence Tomography (AS-OCT), a diagnostic imaging modality first introduced in 1994, serves as an invaluable tool for the detailed assessment of the anterior segment of the eye. It provides high-resolution, cross-sectional images of key structures including the cornea and anterior chamber, enabling precise evaluation of the quantity, specific location, and detailed morphological characteristics of keratic precipitates (KPs), which are inflammatory cell deposits on the corneal endothelium. In the realm of uveitis research, AS-OCT has been extensively employed to directly visualize and quantify the presence of inflammatory cells and flare (protein leakage) within the anterior chamber, offering an objective measure of inflammation. Furthermore, it precisely measures various anatomical dimensions, such as iris thickness and morphology, and corneal thickness, providing essential quantitative data. Beyond these measurements, AS-OCT excels at delivering comprehensive morphological descriptions of KPs, contributing significantly to the understanding of inflammatory processes within the anterior ocular segment [(7)].

This study included 20 patients (40 eyes) diagnosed as cases of Behçet's disease (group A) and 20 healthy controls (group B) (40 eyes). To minimize potential confounding factors, the study enrolled two well-matched groups with no statistically significant differences in baseline characteristics such as age and sex. A comparison of demographic data between the studied groups showed no statistically significant differences in age or gender ($p > 0.05$). The mean age of the case group (group A) was 33.5 years (range: 28–40 years), compared to 33.8 years (range: 24–44 years) in the control group (group B). Males accounted for 70% of the case group and 60% of the control group. These findings demonstrate a notable concordance with the results reported by **Kılıç *et al.* [(8)]**, who conducted a substantial study involving 290 patients diagnosed with Behçet's disease. In their cohort, the participants exhibited a mean age of 45.79 ± 13.05 years. The gender distribution was nearly balanced, with 149 participants (51.4%) identifying as female and 141 participants (48.6%) as male. A more granular analysis of age revealed mean ages of 46.98 ± 13.27 years for females and 44.52 ± 12.75 years for males. Importantly, **Kılıç *et al.* [(8)]** observed no statistically significant difference in age between the male and female subgroups, which aligns with general epidemiological patterns suggesting that while BD can affect various age groups, gender distribution in certain adult cohorts may not show dramatic age discrepancies. Also, **Refaat *et al.* [(9)]** conducted a study in Egypt on 94 BD uveitis patients and found that 65 were males and 29 were females representing 69% male and 31% female, with a mean age of 37 ± 12 years.

In our study, the majority of cases had inactive uveitis (90%), while only a minority (10%) had active disease. Our findings align with **Yalçındağ *et al.* [(10)],** whose study investigated macular structural changes and factors affecting final visual acuity in Behçet's uveitis. They found 63% of patients were inactive and reported significantly impaired Best-Corrected Visual Acuity (BCVA) in these patients. Their research also identified ellipsoid zone damage and loss of normal foveal contour during active uveitis as independent factors influencing final visual acuity, highlighting the importance of macular health for visual outcomes. Also, **Özçelik *Soba et al.* [(11)]** conducted his study to evaluate retinal and choroidal change by using optical coherence tomography (OCT) and found that cases with the active phase were 32% and those with the inactive phase were 67% of Behcet's disease.

A comparison of visual acuity (VA) and best-corrected visual acuity (BCVA) between the case (group A) and control (group B) groups revealed a highly significant difference ($p < 0.01$). The mean VA and BCVA were significantly lower in the case group (0.22 ± 0.10 and 0.06 ± 0.04, respectively) compared to the control group (0.06 ± 0.05 and 0.02 ± 0.02, respectively), indicating better visual function in the control group. These findings showed a significant effect of BD-associated uveitis on visual function. Our results are in agreement with **Elzanaty *et al.* [(12)]** study, which determined pattern of uveitis in Behçet's disease. The study of 113 BD patients, demonstrated a significant reduction in VA among those with panuveitis and optic neuritis ($p < 0.001$), confirming the concept that the severity of ocular involvement directly correlates with visual impairment. This showed the importance of early detection and management of

retinal structural changes to reduce long-term visual deterioration.

In addition, no significant difference was found between the 2 groups regarding intraocular pressure (IOP) ($p > 0.05$), although the mean IOP was slightly higher in the case (group A) than in the control (group B). This suggests that while BD-related uveitis significantly affects vision, it may not have a notable effect on IOP. In strong agreement with **Belkhadir *et al.*** [13], it has been articulated that uveitis, as a manifestation of Behçet's disease, typically does not, in itself, directly lead to a significant elevation of intraocular pressure (IOP). Nevertheless, instances of increased IOP may still be observed in approximately 10% to 20% of cases. When present, this secondary glaucoma can be attributed to several factors: Active trabeculitis (inflammation of the trabecular meshwork), trabecular obstruction caused by the accumulation of inflammatory cells or debris, the formation of anterior or posterior synechiae that impede aqueous humor outflow, or, notably, it can be induced by the prolonged administration of corticosteroids, a common therapeutic agent in managing ocular inflammation in BD. Furthermore, findings reported by **Agra *et al.*** [14] similarly indicated that patients diagnosed with Behçet's uveitis did not demonstrate a statistically significant alteration in intraocular pressure (IOP) throughout the documented course of their disease. This suggests that, in their cohort, the inflammatory activity of Behçet's uveitis did not directly lead to considerable fluctuations in IOP.

In our study the anterior segment optical coherence tomography (AS OCT) findings, specifically pachymetry measurements, revealed a highly significant difference in central pachymetry between the case (group A) and control (group B) groups ($p < 0.01$). The mean central pachymetry was significantly lower in the case group (522.8 ± 11.5 µm) compared to the control group (532.2 ± 5.1 µm) suggesting potential corneal thinning in patients with BD-associated uveitis. On the other hand, no significant difference was observed between the two groups regarding peri-central and paracentral pachymetry ($p > 0.05$). Our findings align with **Ozbek-Uzman *et al.*** [2] who conducted his study to evaluate anterior segment findings in Behçet's disease patients within the ocular involvement in inactive period and demonstrated that Behçet's uveitis patient`s corneal thickness was significantly thinner than in the control group. This suggests that disease activity plays a crucial role in corneal structural changes, reinforcing the importance of monitoring pachymetric variations in BD-associated uveitis. On the contrary**, Ozdamar *et al.*** [15] conducted his study on 69 patient with ocular BD, 24 patient of them had active uveitis. They reported that the mean central pachymetry was significantly higher in those with active disease compared to those with inactive disease and the control group. Several mechanisms have been proposed to explain the inflammatory impact on the corneal endothelium. Various inflammatory mediators and cytokines have been detected in the aqueous humor and cornea during active inflammation, likely contributing to endothelial cell damage.

As regards presence of keratic precipitates (KPs) and posterior synechia in the case (group A) and control (group B) groups revealed that there was a significant difference ($p < 0.05$). Specifically, 12.5% of cases (group A) had keratic precipitates, and 22.5% had posterior synechia, whereas neither condition was observed in the control (group B) group. In agreement with the current study, ***Agra et al.*** [14] observed various anterior segment changes in patients with Behçet's uveitis. Specifically, they reported keratic precipitates in 25% of the patients, posterior synechiae in 29.2%. These findings are consistent with the ocular manifestations seen in Behçet's uveitis, indicating a high prevalence of anterior segment involvement in this condition. The presence of keratic precipitates and posterior synechiae reflects the inflammatory nature of the disease, which can lead to significant complications if not properly managed.

On the other hand, no statistically significant difference was found between the case (group A) and control (group B) groups regarding the anterior chamber (AC) cell score and the number of hyper-reflective spots in AS-OCT ($p > 0.05$). However, 10% of the cases (group A) had an AC cell score of +1 with hyper-reflective spots in AS-OCT (6, 7, or 8 spots), while none of the controls (group B) showed these findings. These current findings align congruently with the research conducted by **Keino *et al.*** [16], whose study meticulously analyzed anterior segment inflammation utilizing Anterior Segment Optical Coherence Tomography (AS OCT). Their investigation, performed on a cohort of 31 patients, encompassing 51 eyes, specifically categorized anterior chamber cells according to the established Standardization of Uveitis Nomenclature (SUN) grading system. Their analysis revealed that 13 eyes presented with a grade of 0, six eyes exhibited a grade of 0.5+, and 12 eyes demonstrated a grade of 1+. Crucially, **Keino *et al.*** [16] observed a direct correlation, noting that the number of cellular spots detected within the anterior chamber progressively increased with a corresponding rise in the SUN grading score for anterior chamber cells, thereby validating the utility of AS OCT in quantifying inflammation. Furthermore, these observations are reinforced by the study reported by **Lu *et al.*** [17]**.** Their research indicated that the count of anterior chamber (AC) hyperreflective spots was significantly higher in the group experiencing active uveitis when compared to both inactive uveitis and control groups. This quantitative distinction implies that the number of hyperreflective spots serves as the most effective parameter for accurately identifying active anterior chamber inflammation, differentiating it robustly from inactive states. Both studies collectively underscore the objective and sensitive capabilities of AS OCT in characterizing and quantifying

inflammatory cellular activity within the anterior segment.

As regarding temporal anterior chamber (AC) angles between the case (group A) group and the control (group B) group revealed no significant difference (p = 0.05) between the case group (38.70 ± 2.84) and the control group (38.6 ± 3.35). These findings are consistent with the study by **Agra *et al.* [14]**, which showed that the mean temporal AC angle remained within normal limits, with no significant difference observed between pre-treatment and post-treatment periods. This lack of significant change could be attributed to the mild to moderate ocular inflammation observed in most of the patients, accompanied by a low frequency of posterior synechiae, which might not have caused substantial alterations in the AC angle.

Regarding the comparison of chamber angle parameters, such as angle opening distance at 500 μm (AOD-500) and trabeculo-iris space area at 500 μm² (TISA-500) measured by AS-OCT, no significant difference was found between the case (group A) and control groups (group B) (p > 0.05). The mean values of AOD-500 (0.37 ± 0.06) and TISA-500 (0.19 ± 0.04) were slightly lower in the case group compared to the control group (AOD-500: 0.39 ± 0.06, TISA-500: 0.20 ± 0.06). These results are in agreement with **Agra *et al.* [14]** who observed no alterations in the anterior chamber angle in patients with Behçet's uveitis**.** These finding indicate that BD-associated uveitis primarily affects the posterior segment, with anterior segment changes being less prominent. The slight decrease in AOD-500 and TISA-500 may indicate minimal structural alterations in the anterior chamber angle that do not reach the threshold for clinical significance. However, given the inflammatory nature of BD, it is possible that chronic or recurrent inflammation may lead to progressive anatomical changes over time, which may not be immediately apparent in cross-sectional analyses.

CONCLUSION

This study highlighted the significant ocular changes associated with Behçet's disease (BD) in patients with anterior uveitis, especially corneal thinning (lower central pachymetry), reduced visual acuity, and the presence of keratic precipitates and posterior synechiae. The findings underscored the critical role of advanced imaging techniques, such as Optical Coherence Tomography (OCT) in monitoring BD-related ocular manifestations. Early detection of these changes is vital for preventing long-term complications, including vision loss. The study confirmed the need for careful monitoring of BD patients for ocular involvement, as it can lead to significant visual impairment if left untreated.

Funding: This work was not financially supported from any organization, society or government.
Conflict of interest: None.

REFERENCES

1. **Ksiaa I, Abroug N, Kechida M *et al.* (2019):** Eye and Behçet's disease. J. Fr. Ophtalmol., 42 (4): 133-146.
2. **Ozbek-Uzman S, Karatas Sungur G, Yalniz-Akkaya Z *et al.* (2020):** Anterior segment parameters in Behçet's patients. Int. Ophthalmol., 40: 1387-1395.
3. **Cetin E, Bozkurt K, Akbulut S *et al.* (2021):** Corneal morphology in noninfectious uveitis. Arq. Bras. Oftalmol., 84 (3): 220-224.
4. **Mirzayev I, Gündüz A, Gündüz Ö *et al.* (2023):** Clinical applications of AS-SS-OCT. Photodiagnosis Photodyn. Ther., 42: 103334.
5. **Rodríguez-Carrio J, Nucera V, Masala F *et al.* (2021):** Behçet disease pathogenesis. Pharmacol. Res., 167: 105593.
6. **Tezcan D, Körez M, Gülcemal S *et al.* (2021):** Haematological parameters in Behçet's. Int. J. Clin. Pract., 75 (10): 14638.
7. **Pichi F, Ometto G, Invernizzi A *et al.* (2023):** Automated quantification of KP by AS-OCT. Clin. Exp. Ophthalmol., 51 (8): 790-798.
8. **Kılıç G, Körüklü K, Kumcu M *et al.* (2024):** Gender disparities in Behçet's syndrome. Immunol. Res., 72 (5): 975-981.
9. **Refaat M, Said A, Ebeid A *et al.* (2021):** Ocular manifestations in Behçet's. Egypt Rheumatol., 43 (1): 81-84.
10. **Yalçındağ F, Temel E, Şekkeli M *et al.* (2021):** Macular changes in Behçet uveitis. Graefes Arch. Clin. Exp. Ophthalmol., 259: 715-721.
11. **Özçelik Soba D, Çitirik M, Berker N (2023):** OCT findings in Behçet's uveitis. Ankyra Med. J., 2 (1): 6-11.
12. **Elzanaty R, Wassef A, Fadel M (2024):** Pattern of uveitis in Behçet's. Egypt Rheumatol., 46 (3): 112-116.
13. **Belkhadir K, Boutimzine N, Tachfouti S *et al.* (2020):** Uveitic glaucoma in Behçet's. J. Fr. Ophtalmol., 43 (7): 635-641.
14. **Agra C, Agra L, Dantas J *et al.* (2014):** AS-OCT in acute anterior uveitis. Arq. Bras. Oftalmol., 77 (1): 1-3.
15. **Ozdamar Y, Berker N, Ertugrul G *et al.* (2010):** Corneal thickness in Behçet's uveitis. Cornea, 29 (11): 1265-1267.
16. **Keino H, Aman T, Furuya R *et al.* (2022):** Automated analysis of anterior segment inflammation. Diagnostics, 12 (11): 2703.
17. **Lu M, Wang X, Lei L *et al.* (2020):** Quantitative analysis of AC inflammation. Am. J. Ophthalmol., 216: 59-68.