# Retinal Optical Coherence Tomography Angiography Findings of Uveitis


## Abstract

**Background:** Uveitis is a common intraocular inflammatory disease and a major cause of preventable blindness worldwide. Optical Coherence Tomography Angiography (OCTA) enables noninvasive assessment of retinal and choroidal microvasculature. This study aimed to evaluate macular vascular changes using OCTA in different types of uveitis.

**Methods:** This cross-sectional study included 66 participants: 37 patients with uveitis (anterior, intermediate, posterior, and panuveitis) and 29 age-matched healthy controls. All participants underwent full ophthalmic examination, including best-corrected visual acuity (BCVA), intraocular pressure (IOP) measurement, slit-lamp biomicroscopy, indirect ophthalmoscopy, and OCTA imaging using the Optovue AngioVue system following pharmacologic pupil dilation.

**Results:** Compared with controls, uveitis patients demonstrated significantly reduced superficial and deep retinal vessel densities across the whole image and all parafoveal and perifoveal regions ($P < 0.001$). Foveal avascular zone area, perimeter, and outer retinal flow density showed no significant differences, while choriocapillaris flow density was significantly reduced in uveitis patients ($P = 0.009$). BCVA differed significantly among uveitis subtypes ($P < 0.001$), with posterior uveitis showing the worst visual outcomes. IOP did not differ significantly between groups. Deep vessel density was largely comparable among subtypes, except in the parafoveal temporal region.

**Conclusion:** OCTA reveals subclinical retinal and choroidal microvascular alterations in uveitis, particularly involving the deep capillary plexus, and may serve as a valuable tool for disease monitoring and prognostication.



**Keywords:** Uveitis, Vessel density, Optical Coherence Tomography Angiography, Foveal Avascular Zone, Intraocular Pressure

## Introduction:

Uveitis is a relatively common, potentially sight-threatening intraocular inflammatory disorder and signifies a major reason of blindness globally [1]**.** Its incidence ranges from 20 to 50 cases per 100,000 persons per year, with a prevalence of 100 to 150 per 100,000 [2].

The etiology of uveitis is complex and multifactorial, involving diverse pathogenic mechanisms. Medical therapy remains the cornerstone of uveitis management, as uncontrolled ocular inflammation can lead to structural complications and a significant risk of visual disability[3]. Moreover, prolonged treatment may impose substantial psychological, economic, and quality-of-life (QoL) burdens. Without timely diagnosis and appropriate therapy, serious complications can result in irreversible visual impairment. Therefore, clinicians should actively seek to identify the underlying cause of uveitis to guide targeted management. In cases of idiopathic uveitis, the optimal therapeutic approach should aim to control inflammation, prevent complications, and minimize irreversible structural and functional ocular damage according to the disease severity [4].

Patients with uveitis exhibit substantially worse visual function and general health status than healthy individuals, as indicated by vision-related quality-of-life (VRQoL) questionnaires and prior research [5]**.**

The QoL of patients is significantly affected by uveitis, however, this adverse effect is particularly pronounced in pediatric patients [6]. A recent study demonstrated a significant decline in overall QoL parameters among children with visual impairment, as assessed by the Paediatric Quality of Life Inventory (PedsQL) Version 4.06 [5] Additionally, numerous studies have demonstrated that uveitis is linked to a lower QoL in children, primarily as a result of the additional medical and psychosocial stressors that are inherent to this population [7, 8]**.** The aim of this work was evaluate macular vascular changes using Optical Coherence Tomography Angiography (OCT-A) in different cases of Uveitis (anterior, intermediate, and posterior).

## Patients and Methods:

This cross-sectional trial was performed on 66 participants 37 in the patient group with uveitis and 29 age-matched healthy volunteers as control group. The study protocol was approved by the Institutional Review Board/Ethics Committee of Benha University, approval number ms 20-7-2024 according to the principles of the Declaration of Helsinki. Written informed consent was taken from all patients (or guardians in case of pediatric patients).

Inclusion criteria included age between 7 and 60 years, with uveitis based on the standardization of uveitis nomenclature (SUN) criteria (anterior, intermediate, posterior, or panuveitis) [9, 10] and ability to undergo OCTA imaging. Exclusion criteria included media opacities preventing high-quality OCTA imaging (dense cataract, corneal opacity, vitreous hemorrhage), high refractive errors (>6D myopia or >3D hyperopia), previous intraocular procedure during the last 3 months, and advanced macular scarring unrelated to uveitis.

All participants were subjected to a comprehensive ophthalmic assessment involving history taking, ocular examination was performed systematically using narrow beam illumination. For anterior chamber activity, a conical (Tyndall) beam was applied at 45°–90° to detect inflammatory cells and flare via the Tyndall effect. Grading of AC cells was performed with a 1 × 1 mm beam according to SUN criteria (0 to 4+). Flare was graded as trace, mild, moderate, or severe, with fibrin considered the highest grade. Additional signs assessed included keratic precipitates, posterior synechiae, and corneal clarity. Anterior chamber depth was estimated by the Van Herick method. The anterior vitreous was examined for cells and haze (visual acuity: Un-aided (UAVA) and best-corrected (BCVA) using Snellen's chart, pupillary reaction and color vision testing, and anterior segment assessment by Slit Lamp, Nidek SL-450 NIDEK CO., LTD., Japan), scan acquisition consisted of 400 B-scans, equally spaced along both X- and Y-axes.

Each B-scan contained 400 A-scans at a resolution of 640 pixels per A-scan. To reduce noise, each scan was repeated at least twice, with the averaged image retained by the device software, and scan areas (3 × 3 mm and 6 × 6 mm macular scans centered on the fovea). IOP was measured using mechanical Haag-Streit AT900 Goldmann applanation tonometer. Posterior segment examined with slit-lamp biomicroscopy using a +90D lens and Binocular indirect ophthalmoscope, HEINE HEINE Optotechnik, omega 500, Germany with a +20D lens. OCTA was performed by the Optovue AngioVue system (Optovue Inc., Fremont, CA, USA). Pupils were dilated with 1% cyclopentolate before imaging.

Primary outcome included comparison of OCTA parameters (vessel density, foveal avascular zone (FAZ) metrics, choriocapillaris flow) between uveitis eyes and healthy controls. Secondary outcomes included association between OCTA findings and clinical activity/severity of uveitis (graded by SUN criteria), and identification of OCTA features distinguishing active versus inactive uveitis.

**Sample Size Calculation:**

A total of 57 eyes with uveitis were enrolled consecutively from patients attending the outpatient clinic, along with 57 eyes from healthy controls for comparison.

Approval code: MS 19-7-2024

**Statistical analysis**

Data were analyzed by IBM SPSS Statistics for Windows, Version 29.0 (IBM Corp., Armonk, NY, USA). Categorical variables were summarized as frequencies and percentages, and continuous variables as mean ± SD for normally distributed data or median (IQR) for non-normally distributed data. Normality was evaluated by the Shapiro–Wilk test. Comparisons between two independent groups were conducted using the independent samples t-test or Mann–Whitney U test, while comparisons among three uveitis subtypes were conducted by one-way ANOVA or the Kruskal–Wallis test with post hoc pairwise comparisons when

appropriate. Categorical variables were analyzed using Pearson's chi-square, Fisher's exact, or Fisher–Freeman–Halton exact tests. Spearman's correlation coefficient assessed associations between vessel densities and BCVA or IOP. A p value < 0.05 was regarded statistically significant.

## Results:

**Table 1** summarizes participant demographics and comorbidities in the uveitis group.

**Table 1: Baseline demographic characteristics of the study participants (N=66).**

| | **N=66** |
|---|---|
| **Sex** | |
| **Male** | 30 (45.5%) |
| **Female** | 36 (54.5%) |
| **Age (years)** | 31.18 ± 12.55<br>28.0 (25.0–35.0) |
| **Past medical history of the patients in the uveitis group (n=37)** | |
| **Free (no systemic disease)** | 12 (32.4%) |
| **Headache and tinnitus** | 7 (18.9%) |
| **AS** | 3 (8.1%) |
| **DM** | 2 (5.4%) |
| **Behçet** | 2 (5.4%) |
| **TB** | 2 (5.4%) |
| **HTN** | 1 (2.7%) |
| **Bilharziasis** | 1 (2.7%) |
| **Fibromyalgia** | 1 (2.7%) |
| **Herpes simplex** | 1 (2.7%) |
| **Herpes zoster skin rash** | 1 (2.7%) |
| **Neuro-Behçet** | 1 (2.7%) |
| **Recurrent painful oral ulcers** | 1 (2.7%) |
| **Sarcoidosis** | 1 (2.7%) |
| **SLE** | 1 (2.7%) |

Data were expressed as mean ± SD and median (IQR) for continuous variables, and as frequency (percentage) for categorical variables, AS, Ankylosing spondylitis; DM, Diabetes mellitus; HTN, Hypertension; SLE, Systemic lupus erythematosus; TB, Tuberculosis; SD, Standard Deviation; IQR, Interquartile Range

Ocular examination revealed a predominance of anterior uveitis, with mostly normal pupillary reactions among affected eyes **Table 2.**

**Table 2: Ocular examination in uveitis group (n=57).**

| | N=57 |
|---|---|
| **Diagnosis** | |
| **Anterior uveitis** | 36 (63.2%) |
| **Posterior uveitis** | 3 (5.3%) |
| **Panuveitis** | 18 (31.6%) |
| **Eye (R/L)** | |
| **RE** | 28 (49.1%) |
| **LE** | 29 (50.9%) |
| **Pupil** | |
| **RRR** | 42 (73.7%) |
| **Irregular** | 14 (24.6%) |
| **RAPD** | 1 (1.8%) |
| **Color Vision** | |
| **Full** | 43 (75.4%) |
| **Impaired** | 14 (24.6%) |
| **Cornea** | |
| **Clear** | 54 (94.7%) |
| **Hazy** | 3 (5.3%) |
| **KPS** | 12 (100.0%) |
| **AC Flare** | |
| **Faint** | 23 (40.4%) |
| **Moderate** | 7 (12.3%) |
| **Marked** | 3 (5.3%) |
| **Synechiae** | |
| **AS** | 1 (1.8%) |
| **PS** | 13 (22.8%) |
| **Lens** | |
| **Clear** | 34 (59.6%) |
| **Cataract** | 22 (38.6%) |
| **IOL** | 1 (1.8%) |
| **Retrolenticular** | |
| **NAD** | 30 (52.6%) |
| **Cells** | 21 (36.8%) |
| **Cells spillover** | 6 (10.5%) |
| **Vitritis** | |
| **NAD** | 34 (59.6%) |
| **Mild** | 15 (26.3%) |
| **Minimal** | 8 (14.0%) |
| **Parsplanitis** | |
| **NAD** | 56 (98.2%) |
| **Snow balls** | 1 (1.8%) |
| **Posterior Segment** | |
| **NAD** | 36 (63.2%) |
| **Disc swelling** | 18 (31.6%) |
| **NSD** | 12 (21.1%) |
| **MC** | 16 (28.1%) |
| **Arteritis** | 2 (3.5%) |
| **BRAO** | 1 (1.8%) |
| **Chorioretinal scars** | 1 (1.8%) |
| **Cilioretinal artery occlusion** | 1 (1.8%) |
| **CRVO** | 1 (1.8%) |

| | |
|---|---|
| **Phlebitis** | 1 (1.8%) |
| **BCVA** | 0.40 ± 0.29 |
| **IOP** | 6.00 ± 3.21 |
| **AC Cells** | 1.94 ± 1.09 |

Data are expressed as frequency (percentage) for categorical variables and as mean ± SD and median (IQR) for continuous variables, AC, anterior chamber; AS, anterior synechiae; BCVA, best-corrected visual acuity; BRAO, branch retinal artery occlusion; CRVO, central retinal vein occlusion; IOL, intraocular lens; IOP, intraocular pressure; KPs, keratic precipitates; LE, left eye; MC, macular changes; NAD, no abnormality detected; NSD, neurosensory detachment; PS, posterior synechiae; RAPD, relative afferent pupillary defect; RE, right eye

**Table 3** compares deep and superficial retinal vessel densities and vascular flow parameters between the uveitis and control groups. The uveitis group exhibited significantly decreased deep and superficial vessel densities across the whole retina and all perifoveal and parafoveal regions (all $P < 0.001$), except for the foveal area, where no significant difference was demonstrated (superficial $P = 0.934$; deep $P = 0.103$). Vascular parameters such as FAZ area, FAZ perimeter, and blood flow density of the outer retina exhibited no significant differences among groups ($P = 0.179$, 0.086, and 0.177, respectively). Nevertheless, blood flow density of the choriocapillaris was significantly reduced in the uveitis group ($P = 0.009$).

**Table 3. Comparison of superficial vessel, deep densities, FAZ, FAZ perimeter, and flow parameters between the uveitis and control groups (N=114).**

| Retinal region | Uveitis group (n=57) | Control group (n=57) | P-value |
|---|---|---|---|
| **Superficial densities** | | | |
| **Whole** | 46.70 ± 6.18 | 50.95 ± 2.81 | <0.001 |
| **Fovea** | 20.68 ± 11.09<br>21.50 (13.80–25.90) | 20.54 ± 7.37 | 0.934t |
| **Parafoveal Temporal** | 48.70 ± 9.16 | 53.89 ± 4.91 | <0.001 |
| **Parafoveal Superior** | 49.41 ± 8.35 | 55.69 ± 4.50 | <0.001 |
| **Parafoveal Nasal** | 47.83 ± 9.02 | 53.55 ± 5.12 | <0.001 |
| **Parafoveal Inferior** | 49.31 ± 9.28 | 54.56 ± 4.82 | <0.001 |
| **Perifoveal Temporal** | 44.08 ± 6.97 | 47.81 ± 6.78<br>48.55 (46.60–50.75) | <0.001 |
| **Perifoveal Superior** | 47.10 ± 6.03 | 51.56 ± 3.47 | <0.001 |
| **Perifoveal Nasal** | 49.79 ± 7.52 | 53.23 ± 8.82 | <0.001 |
| **Perifoveal Inferior** | 46.49 ± 9.46 | 52.15 ± 3.01 | <0.001 |
| **Deep vessel densities** | | | |
| **Whole** | 46.37 ± 8.72 | 55.56 ± 5.94 | <0.001 |
| **Fovea** | 35.67 ± 11.48 | 38.66 ± 7.47 | 0.103 t |
| **Parafoveal Temporal** | 52.42 ± 7.77 | 60.31 ± 4.31 | <0.001 |
| **Parafoveal Superior** | 51.85 ± 7.96 | 59.25 ± 5.37 | <0.001 t |
| **Parafoveal Nasal** | 52.13 ± 8.78 | 60.02 ± 4.65 | <0.001 |
| **Parafoveal Inferior** | 50.46 ± 9.16 | 58.19 ± 5.26 | <0.001 |
| **Perifoveal Temporal** | 48.71 ± 11.82 | 59.45 ± 5.58 | <0.001 |
| **Perifoveal Superior** | 46.34 ± 8.65 | 56.38 ± 7.35 | <0.001 t |

| | | | |
|---|---|---|---|
| **Perifoveal Nasal** | 46.13 ± 10.43 | 54.19 ± 10.92 | <0.001 |
| **Perifoveal Inferior** | 45.25 ± 11.84 | 57.12 ± 7.14 | <0.001 |
| **FAZ, Flow parameters** | | | |
| **FAZ (mm²)** | 0.34 ± 0.17 | 0.29 ± 0.10 | 0.179 |
| **FAZ perimeter** | 2.23 ± 0.63 | 2.07 ± 0.43 | 0.086 |
| **Blood flow density of the outer retina** | 0.97 ± 0.72 | 0.79 ± 0.60 | 0.177 |
| **Blood flow density of the choriocapillaris** | 2.06 ± 0.22 | 2.15 ± 0.20 | 0.009 |

Data are exressed as mean ± SD and median (IQR). P values were calculated using the independent t-test ([t]) or Mann–Whitney U test, as appropriate, Values in bold show statistical significance at P<0.05. IQR, interquartile range; SD, standard deviation, FAZ, Foveal avascular zone.

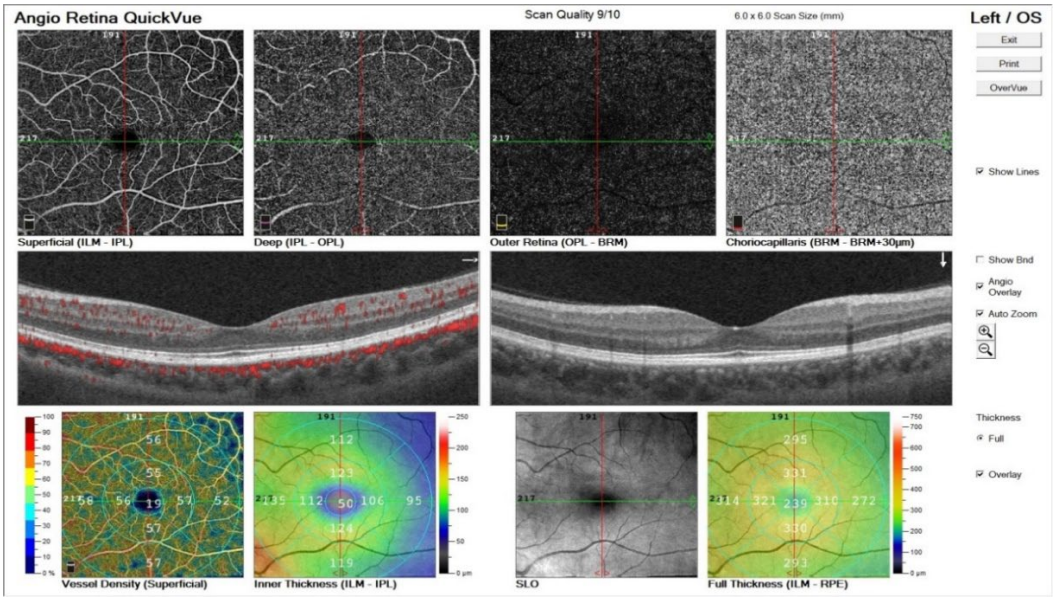
**Table 4** compares BCVA, IOP, deep and superficial vessel densities, and vascular flow parameters among anterior uveitis, posterior uveitis, and panuveitis groups. BCVA differed significantly across groups ($P < 0.001$), with posterior uveitis showing lower values; however, no significant difference was noted between anterior uveitis and panuveitis (post-hoc $P = 0.096$). IOP showed no significant variation ($P = 0.183$). Superficial vessel densities were comparable across all retinal regions, with no significant differences found (all $P > 0.05$). Deep vessel densities were mostly similar, except for a significant difference in the parafoveal temporal region ($P = 0.022$), although post-hoc comparisons did not reveal group differences. FAZ area, FAZ perimeter, blood flow density of the outer retina, and choriocapillaris flow exhibited no significant differences among groups ($P = 0.539$, 0.948, 0.654, and 0.287, respectively).

**Table 4. Comparison of BCVA and IOP, superficial and deep vessel densities, FAZ, FAZ perimeter, and flow parameters among uveitis subtypes (N=57).**

| | **Anterior Uveitis (n=36)** | **Posterior Uveitis (n=3)** | **Panuveitis (n=18)** | **P-value** |
|---|---|---|---|---|
| **Parameter** | | | | |
| **BCVA** | 0.51 ± 0.27 | 0.14 ± 0.15 | 0.22 ± 0.24 | <0.001<br>P1=0.096<br>P2>0.999<br>P3=0.001 |
| **IOP (mmHg)** | 5.97 ± 3.33 | 9.33 ± 2.89 | 5.50 ± 2.81 | 0.183 |
| **FAZ and flow parameters** | | | | |
| **FAZ (mm²)** | 0.33 ± 0.14 | 0.44 ± 0.17 | 0.33 ± 0.22 | 0.539 |
| **FAZ perimeter (mm)** | 2.24 ± 0.49 | 2.32 ± 0.10 | 2.20 ± 0.90 | 0.948 |

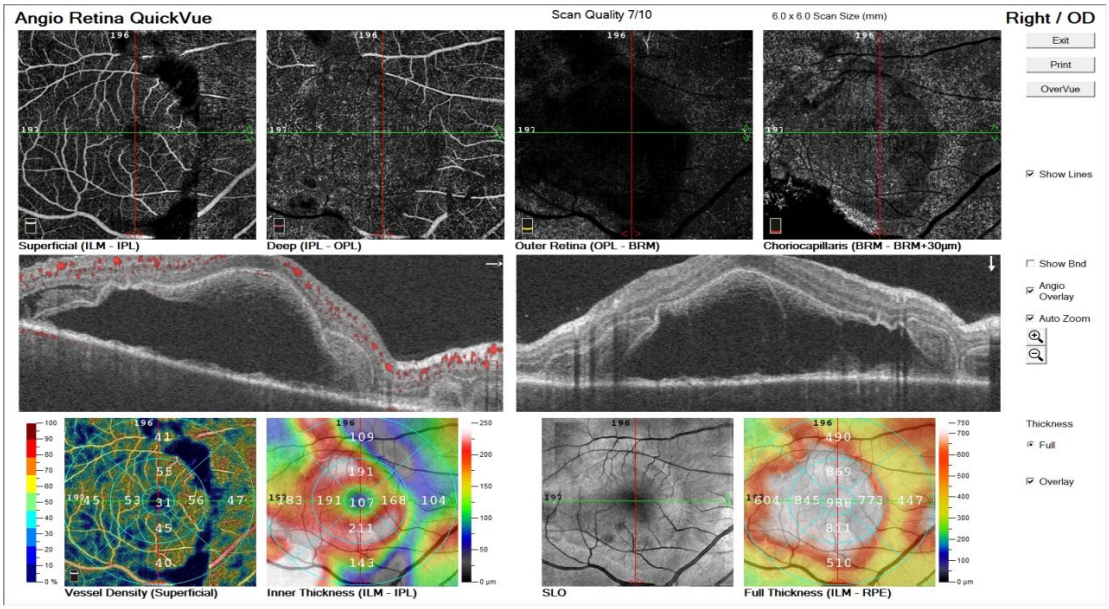
| | | | | |
|---|---|---|---|---|
| **Blood flow density of the outer retina** | 0.88 ± 0.54 | 0.88 ± 1.21 | 1.16 ± 0.94 | 0.654¥ |
| **Blood flow density of the choriocapillaris** | 2.11 ± 0.10 | 1.72 ± 0.41 | 2.01 ± 0.30 | 0.287¥ |
| **Retinal region** | | | | |
| **Whole (%)** | 47.94 ± 4.63 | 40.73 ± 18.22 | 45.21 ± 5.55 | 0.260¥ |
| **Fovea (%)** | 18.93 ± 7.79 | 14.07 ± 12.23 | 25.29 ± 15.02 | 0.077 |
| **Parafoveal Temporal (%)** | 50.14 ± 5.42 | 38.77 ± 29.85 | 47.47 ± 9.38 | 0.553¥ |
| **Parafoveal Superior (%)** | 50.78 ± 5.31 | 48.63 ± 15.74 | 46.80 ± 11.46 | 0.257 |
| **Parafoveal Nasal (%)** | 49.01 ± 6.96 | 41.33 ± 23.70 | 46.56 ± 9.48 | 0.690¥ |
| **Parafoveal Inferior (%)** | 50.54 ± 6.09 | 38.53 ± 32.94 | 48.66 ± 7.43 | 0.646¥ |
| **Perifoveal Temporal (%)** | 44.24 ± 6.45 | 45.90 ± 4.89 | 43.45 ± 8.39 | 0.724¥ |
| **Perifoveal Superior (%)** | 48.25 ± 4.59 | 43.77 ± 14.35 | 45.36 ± 6.66 | 0.156 |
| **Perifoveal Nasal (%)** | 51.62 ± 5.11 | 43.00 ± 22.03 | 47.27 ± 7.32 | 0.127¥ |
| **Perifoveal Inferior (%)** | 48.65 ± 6.50 | 36.80 ± 24.16 | 43.78 ± 10.25 | 0.224 |
| **Whole Deep** | 47.26 ± 7.88 | 38.97 ± 21.01 | 45.83 ± 7.69 48.50 | 0.276 |
| **Fovea Deep** | 34.19 ± 9.27 | 25.87 ± 14.81 | 40.27 ± 13.69 | 0.056 |
| **Parafoveal Temporal** | 54.49 ± 5.80 | 46.07 ± 14.87 | 49.34 ± 8.81 | 0.022<br>P1=0.188<br>P2=0.057<br>P3>0.999 |
| **Parafoveal Superior** | 51.97 ± 6.79 | 54.60 ± 5.40 | 51.14 ± 10.42 | 0.782 |
| **Parafoveal Nasal** | 54.21 ± 5.89 | 43.60 ± 19.78 | 49.39 ± 10.32 | 0.142¥ |
| **Parafoveal Inferior** | 51.43 ± 6.29 | 37.40 ± 28.48 | 50.68 ± 8.23 | 0.521¥ |
| **Perifoveal Temporal** | 50.03 ± 8.38 | 37.37 ± 32.34 | 47.97 ± 12.89 | 0.996¥ |
| **Perifoveal Superior** | 46.86 ± 9.14 | 43.97 ± 13.45 | 45.68 ± 7.14 | 0.961 |
| **Perifoveal Nasal** | 47.91 ± 9.05 | 37.33 ± 20.49 | 44.04 ± 10.74 | 0.549 |
| **Perifoveal Inferior** | 46.28 ± 10.37 | 38.57 ± 24.36 | 44.33 ± 12.64 | 0.974 |

Data are expressed as mean ± SD and median (IQR), BCVA, best-corrected visual acuity; IOP, intraocular pressure values were calculated using Kruskal–Wallis test; P1: Anterior vs. Posterior Uveitis; P2: Anterior vs. Panuveitis.P3: Posterior vs. Panuveitis. Bold values denote statistical significance at $P<0.05$, FAZ, foveal avascular zone; FAZ perimeter, perimeter of the foveal avascular zone

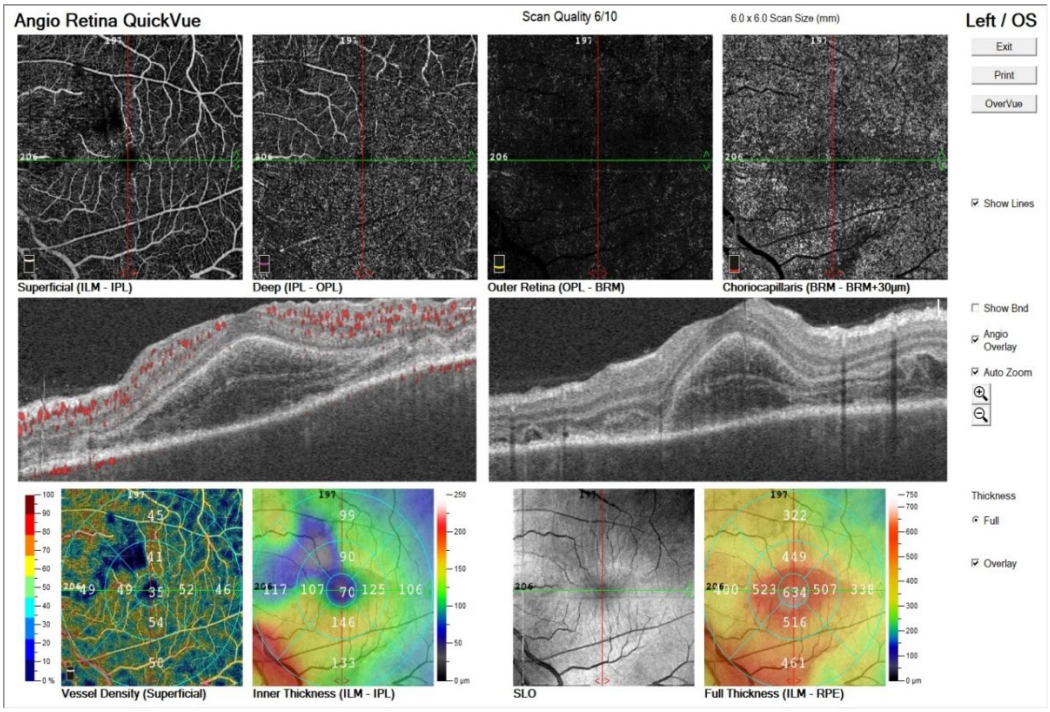



OCTA of the patient during the attack Showed within normal vascular density in superficial and deep capillary plexuses.

**Figure 1:Case (1)OCTA and clinical findings of a 27-year-old female presenting with left eye blurred vision, red eye, and ocular pain. Right eye showed normal vision (BCVA 6/6) and intraocular pressure (14 mmHg) with no abnormalities. Left eye had reduced vision (BCVA 0.4), lower IOP (11 mmHg), anterior segment inflammation (cells grade 4, marked flare, posterior synechiae, posterior subcapsular cataract), and posterior segment involvement (vitreous cells spillover and hyperemic swollen optic disc). Infection screening was negative, MRI sacroiliac joint was normal, but inflammatory markers (ESR, CRP) were elevated. The patient improved following treatment with topical prednisone and cycloplegics**




OCTA of the right eye during the attack showed reduced vascular density in both superficial and deep capillary plexuses.




OCTA of the left eye during the attack showed reduced vascular density in both superficial and deep capillary plexuses.

**Figure2 :Case (2) OCTA and clinical findings of a 32-year-old male presenting with acute bilateral blurred vision, preceded by headache and tinnitus. Right eye showed BCVA of 3/60, IOP 14 mmHg, anterior segment inflammation (cells grade 2), and posterior segment vitritis with multiple neurosensory detachments and disc swelling. Left eye had BCVA of 0.05, IOP 17 mmHg, anterior segment cells grade 2, and similar posterior segment findings. Infection screening was negative. OCT revealed bacillary layer detachment with subretinal exudation, consistent with Vogt-Koyanagi-Harada (VKH) disease. The case was managed with pulse steroids then oral steroids and mycophenolate mofetil, resulting in final BCVA of 0.5 OU, a flat retina, and areas of depigmentation**

## Discussion

Uveitis is a common, potentially blinding intraocular inflammatory disorder that affects the uveal tract and adjacent ocular structures. It represents a significant global health concern and remains one of the major reasons of preventable blindness globally [1].

OCTA is an imaging modality that uses motion contrast to produce images of retinal vascular layers in a rapid, non-invasive manner. It offers visualization of superficial and deep capillary plexuses [11].

OCTA revealed that the SVD was significantly decreased in the uveitis group versus controls across the whole parafoveal, and perifoveal regions ($P < 0.001$), with no significant difference

at the fovea. Similarly, DVD was markedly reduced in all sectors except the central fovea. Our results suggest that uveitis predominantly affects the perifoveal microvasculature, sparing the foveal center.

Comparable results were found by Kim et al. **[13],** who revealed significant parafoveal capillary loss in uveitic eyes, and by Tian et al. [14]**,** who observed more profound involvement of the deep capillary plexus than the superficial one, likely due to its greater susceptibility to ischemia and inflammatory insult**.**

Although FAZ area and perimeter did not differ significantly within uveitic and control eyes, choriocapillaris blood-flow density was significantly decreased in the uveitis group ($P = 0.009$). This suggests that choroidal microcirculation may be compromised even when macular structural parameters appear intact.

Also, Ebrahimiadib et al. and Khairallah et al. [15, 16] demonstrated reduced choriocapillaris perfusion and correlations between capillary density and BCVA in uveitic eyes**.**

In contrast, Waizel et al. [17] found enlargement of the deep FAZ particularly in posterior uveitis, emphasizing the variability of FAZ response depending on disease subtype and macular edema status**.**

When comparing OCTA parameters among anterior, posterior, and panuveitis subgroups, no significant differences were observed in either deep or superficial vessel densities, FAZ metrics, or choriocapillaris flow. Similarly, Kim et al. [13]**,** observed no consistent OCTA pattern across anatomic subtypes of uveitis. The similarity of microvascular impairment across subtypes suggests a shared inflammatory pathway affecting retinal perfusion, regardless of the primary site of inflammation**.**

Both superficial and deep vessel densities were positively associated with BCVA, particularly in the perifoveal and parafoveal regions, indicating that preserved retinal microcirculation contributes to better visual outcomes. No significant correlations were observed between

OCTA parameters and intraocular pressure. These findings highlight that visual function in uveitic patients depends primarily on microvascular integrity rather than on pressure-related factors, reinforcing OCTA's potential as a noninvasive biomarker for visual prognosis.

A study by Waizel et al. [17] showed that eyes with non-infectious posterior uveitis had significantly larger deep FAZ areas versus healthy eyes, regardless of macular edema. In anterior uveitis, FAZ enlargement was only evident when macular edema was present. Overall, the study concluded that posterior uveitis is consistently associated with deep retinal FAZ enlargement, indicating microvascular disruption even when macular oedema is not present.

Khairallah et al. [16] found that based on quantitative analyses FAZ areas were present in eyes with Behçet's uveitis (BU) in comparison to control eyes in both the superficial and deep capillary plexuses, although the difference was not statistically significant. In the deep capillary plexus (DCP), the capillary vessel density (CVD) was significantly decreased in eyes with BU than in the control group. Additionally, BCVA was associated with the FAZ area and CVD.

An investigation by Alice Y. Kim et al. [13] subjects with uveitis were categorised into anterior, posterior, and panuveitis groups. Each subgroup was contrasted with its respective healthy control group. Overall, the results were consistent across all subgroups, with no significant or consistent differences in any parameter based on the anatomic classification of uveitis.

Limitations: Include the relatively small sample size, the acquisition of OCTA images at a single time point without follow-up, which limits the assessment of longitudinal vascular alterations, and the restricted age range of participants (15–55 years). In addition, the study represented a limited spectrum of uveitic disorders and disease entities.

## Conclusions:

Even in the absence of overt macular changes, OCTA is a valuable, noninvasive modality for identifying retinal and choroidal microvascular alterations in uveitic eyes. The significance of microvascular integrity in visual function is underscored by the reduced vessel density,

particularly in the deep capillary plexus, and its significant correlation with BCVA. This supports OCTA as a sensitive biomarker for disease monitoring and prognostic assessment in uveitis.

**Financial support and sponsorship:** Nil

**Conflict of Interest:** Nil

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