A retrospective analysis on comparison of optical coherence tomography manifestations among AMD, CEC, PM and ICN and its relationship with vision

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Background: Both macular choroidal neovascularization (MCN) and visual changes can occur in age-related macular degeneration (AMD), central exudative chorioretinopathy (CEC), pathological myopia (PM) and idiopathic choroidal neovascularization (ICN), but whether the optical coherence tomography (OCT) manifestations of the four diseases are different and their relationships with vision are not clear. This study clarifies this problem and can guide clinicians to prevent vision changes of patients according to OCT performance.

Methods: 76 patients with MCN, included 25 AMD, 21 CEC, 18 PM and 12 ICN [refer to Chinese Ophthalmology (3rd Edition)], detected by OCT instrument, were enrolled in this study from June 2020 to June 2022. The OCT manifestations and indexes were observed. A comprehensive refractometer was used for detection of best corrected visual acuity (BCVA) and axial length (AL). Pearson chi squared and 1 way analysis of variance were used for enumeration data and continuous data test, and Pearson correlation coefficient was used for relationship analysis.

Results: (I) Macular edema proportions in the MCN eyes among AMD, CEC, PM and ICN groups were 96.00% and 94.12%, 14.29% and 14.29%, 44.44% and 32.00%, 33.33% and 28.57%, with statistical differences (both P<0.001). (II) Patients with macular edema had a significantly higher loose and thickened tissue reflex of the neuroepithelial layer (100.00% *vs.* 4.26%) and limited non-reflective dark area (100.00% *vs.* 4.26%) (both P<0.001). (III) PM had the lowest width, height and central fovea thickness (CFT) [(1,403.43±114.41), (210.74±21.22) and (250.70±41.36) μm], and the highest distance to the fovea, BCVA and AL [(234.44±288.69) μm, (0.30±0.08) Log minimal angle of resolution (MAR), (28.48±5.72) mm] (all P<0.001). (IV) The width and height of patients with macular edema were lower than those of patients without macular edema [(1,738.43±348.71) *vs.* (2,493.95±771.53) μm, P<0.001; (305.71±81.22) *vs.* (367.29±107.91) μm, P=0.002] (P<0.05). (V) The width and height, CFT were negatively correlated to BCVA (r=−0.635, −0.712, −0.724, all P<0.001), and height, CFT were negatively correlated to AL (r=−0.244, −0.275, P=0.018, 0.007). The distance to the fovea was positively correlated to BCVA and AL (r=0.241, P=0.019; r=0.267, P=0.007).

Conclusions: Most of the OCT indexes were related to the BCVA and AL in MCN patients, and MCN patients with OCT changes should be reminded to protect their vision.

Keywords: Optical coherence tomography (OCT); macular choroidal neovascularization (MCN); vision

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Introduction

Choroidal neovascularization (CNV) refers to the proliferating vessels derived from choroidal capillaries, which are closely related to some diseases (1). CNV usually occurs in the macular region, and CNV in this region is known as macular choroidal neovascularization (MCN). CNV is secondary to a variety of eye diseases, including age-related macular degeneration (AMD), central exudative chorioretinopathy (CEC) and idiopathic choroidal neovascularization (ICN). As the permeability of MCN blood vessels is higher than that of normal blood vessels, bleeding and exudation can be caused very easily, which in turn can lead to scar formation and macular damage, which has a serious effect on central vision (2). Thus, pathological myopia (PM) patients are very prone to blindness. The incidence of bilateral involvement of CNV in AMD patients has been reported to be about 15.4–46.0%, and anti-vascular endothelial growth factor injections need to be implemented in a timely manner to reduce the burden of the disease (3).

Optical coherence tomography (OCT) is a new type of tomography technology, which has great value in living tissue detection and has been widely used in the diagnosis of ophthalmological, dental, and dermatological diseases (4,5). This technology represented a new breakthrough after X-ray and other imaging technologies, and OCT can accurately display vascular lesions. In patients with MCN, OCT mostly shows the retinal pigment epithelium (RPE)/subchoroidal capillary layer bulge reflex zone, and the reflex zone has different size, which is locally enhanced, fusiform, hemispherical, with basically clear boundaries, and notably, most of the reflex zone protrude RPE tissues (6-8). In some patients with macular retinal edema, OCT mostly shows the RPE/subchoroidal capillary layer bulge reflex zone with basically clear boundaries (9). Another, both MCN and visual changes can occur in AMD, CEC, PM and ICN patients, and to know about the differences of OCT manifestations and parameters in different MCN patients and their relationships with vision is helpful to guide clinicians to implement individualized guidance for different types of MCN patients to prevent vision changes. Further, in some MCN patients, the neuroepithelial tissue around the lesion has loose and thickened reflexes, and local non-reflective dark areas under the tissue are common (9). Studies have shown that the OCT indicators of AMD patients are related to vision, and that the width and central fovea thickness (CFT) are negatively related to best corrected visual acuity (BCVA), which suggests that MCN patients may also have PM, and vision may be related to the OCT findings and indicators (10,11), but whether the OCT manifestations and indexes of the AMD, CEC, PM and ICN diseases are different and their relationships with vision are not clear. However, further research needs to be conducted on the relationship between OCT and vision in MCN patients to guide clinicians in how to treat MCN patients and evaluate their prognosis. We present the following article in accordance with the STROBE reporting checklist (available at https://atm.amegroups.com/article/view/10.21037/atm-22-5917/rc).

Highlight box

Key findings

- Most of the OCT indexes were related to the BCVA and AL in MCN patients.

What is known and what is new?

- Patients with MCN may have vision changes.
- The manifestations and parameter changes of OCT were summarized in MCN, and the relationship between OCT and vision was analyzed.

What is the implication, and what should change now?

- Clinicians should pay attention to the OCT performance and parameter changes of patients with MCN to improve their vision.

Methods

The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). The study was approved by the ethics board of the First Affiliated Hospital of Zhengzhou University (No. 2021-KY-0423-001) and informed consent was taken from all the patients.

Clinical research design

The study was designed according to retrospective analysis.

Sample size estimation

PASS11.0 software was used to estimate the sample size, and clicked Means, ANOVA, Analysis of Variance, One-Way Analysis of Variance, Power=0.90, α=0.05, k=4, means and S were got by pretest according to BCVA, defaulted others, and finally clicked Run.

Baseline factor assessment

The baseline data of patients are taken as interference factors, including gender, age, eye condition, macular edema, because these may affect OCT performance and visual indicators.

Patient selection

A total of 76 patients (94 eyes with MCN, named ill eyes) with MCN, as detected by OCT, from the First Affiliated Hospital of Zhengzhou University, were enrolled in this study from June 2020 to June 2022. To be eligible for inclusion in this study, patients had to meet the following inclusion criteria: (I) have been confirmed to have MCN, and the disease types were diagnosed according to Chinese Ophthalmology (3rd Edition) (12); (II) have MCM detected by OCT; and (III) have voluntarily agreed to participate in this study and have provided their written consent. Patients were excluded from the study if they met any of the following exclusion criteria: (I) had other types of eye diseases, such as serious dry eye or glaucoma; (II) had a history of ocular trauma; (III) had optic nerve disease; (IV) had contraindications for OCT, such as refractive interstitial opacity; and/or (V) had a history of eye surgery. Of the patients, 43 were male (58 ill eyes) and 33 were female (44 ill eyes). The patients had an average age of 62.52 years (range, 32–80 years old), and 39 (47 ill eyes) had macular edema. Among the patients, 25 had AMD (34 ill eyes), 21 had CEC (21 ill eyes), 18 had PM (25 ill eyes), and 12 had ICN (14 ill eyes), and these patients were allocated to the AMD, CEC, PM and ICN groups, respectively.

Study methods

An OCT instrument (Heidelberg, Germany, Spectralis type) was used to perform the linear scanning of the macular region, and the depth was set to 2 mm. Before the examination, compound tropicamide eye drops were administered to fully dilate the pupils, and each patient's gaze state and the lesion area scanned through the monitoring screen were observed. Clear and typical images were selected, saved and analyzed, and their features were examined to observe OCT manifestations. The width (width of the base breakthrough RPE/choroidal capillary composite layer), height (height of the base breakthrough RPE/choroidal capillary composite layer), distance to the fovea (distance of the base breakthrough RPE/choroidal capillary composite layer to the fovea), and CFT of the MCN patients' were measured with the OCT instrument. A comprehensive refractometer (TOPCON, Japan, RM-800 type) was used for the visual inspection, and the BCVA and axial length (AL) were recorded, BCVA was detected by international standard visual acuity chart, then converted to LogMAR, and MAR is minimal angle of resolution. AL is the distance from the surface of the cornea to the surface of the retina.

Observation parameters

The general data, OCT manifestations and indexes, BCVA and AL were compared among the 4 groups. The relationships between the OCT indexes and the BCVA and AL were analyzed.

Statistical analyses

The data were analyzed by SPSS 18.0. For the enumeration data, the percentages were calculated, and the Pearson chi squared test or Fisher's exact test were used. For the normally distributed continuous data, the means with standard deviations were calculated as appropriate, and tested by a 1-way analysis of variance and *Student-Newman-Keuls-q*. Pearson correlation coefficient was used to analyze the relationships between the OCT indexes and the BCVA in each group. Except for general information, macular edema and other indicators were counted according to the number of eyes. Bilateral $\alpha=0.05$ was test standard, and P values <0.05 were considered statistically significant.

Results

Patient general data

As *Table 1* shows, there were no statistically significant differences among the groups in terms of gender and age ($P>0.05$), but there were statistically significant differences among the groups in terms of the ill eyes and macular edema ($P<0.05$).

OCT manifestations

As *Table 2* shows, there were no statistically significant differences in the RPE/subchoriocapillary ridge reflex

Table 1 Comparison of general data among the groups

General data	AMD group (n=25)	CEC group (n=21)	PM group (n=18)	ICN group (n=12)	Chi-square	P
Gender					2.074	0.557
Male	15 (60.00)	11 (52.38)	12 (66.67)	5 (41.67)		
Female	10 (40.00)	10 (47.62)	6 (33.33)	7 (58.33)		
Age (years)	62.56±4.82	65.29±3.89	61.72±9.96	64.75±9.53	1.114	0.349
Ill eyes					11.096	0.011
Monocular	16 (64.00)	21 (100.00)	11 (63.33)	10 (83.33)		
Binocular	9 (36.00)	0 (0.00)	7 (38.89)	2 (16.67)		
Macular edema (cases)	24 (96.00)	3 (14.29)	8 (44.44)	4 (33.33)	32.961	<0.001
Total ill eyes	34	21	25	14	42.539	<0.001
Macular edema (ill eyes)	32 (94.12)	3 (14.29)	8 (32.00)	4 (28.57)		

Data are presented as mean ± standard deviation or number (%). AMD, age-related macular degeneration; CEC, central exudative chorioretinopathy; PM, pathological myopia; ICN, idiopathic choroidal neovascularization.

Table 2 Comparison of the OCT manifestations among the groups

OCT manifestations	AMD group (n=34)	CEC group (n=21)	PM group (n=25)	ICN group (n=14)	Chi-square	P
RPE/subchoriocapillary ridge reflex zone	34 (100.00)	21 (100.00)	25 (100.00)	14 (100.00)	0.000	1.000
Reflective zone exceeding the RPE tissue	31 (91.18)	20 (95.24)	21 (84.00)	13 (92.86)	1.813	0.612
Limited enhanced reflective band	34 (100.00)	21 (100.00)	25 (100.00)	13 (92.86)	4.345	0.227
Loose and thickened tissue reflex of the neuroepithelial layer	32 (94.12)	4 (19.05)	7 (28.00)	6 (42.86)	40.046	<0.001
Limited non-reflective dark area	32 (94.12)	4 (19.05)	7 (28.00)	6 (42.86)	40.046	<0.001

Data are presented as number (%). OCT, optical coherence tomography; RPE, retinal pigment epithelium; AMD, age-related macular degeneration; CEC, central exudative chorioretinopathy; PM, pathological myopia; ICN, idiopathic choroidal neovascularization.

Table 3 Comparison of the OCT manifestations between patients with and without macular edema

OCT manifestations	With macular edema (n=47)	Without macular edema (n=47)	Chi-square	P
RPE/subchoriocapillary ridge reflex zone	47 (100.00)	47 (100.00)	0.000	1.000
Reflective zone exceeding the RPE tissue	41 (87.23)	44 (93.62)	0.665	0.506
Limited enhanced reflective band	47 (100.00)	46 (97.87)	0.584	0.559
Loose and thickened tissue reflex of the neuroepithelial layer	47 (100.00)	2 (4.26)	9.030	<0.001
Limited non-reflective dark area	47 (100.00)	2 (4.26)	9.030	<0.001

Data are presented as number (%). OCT, optical coherence tomography; RPE, retinal pigment epithelium.

zone, reflective zone exceeding the RPE tissue, and limited enhanced reflective band of the OCT manifestations among the 4 groups (P>0.05), but there were statistically significant differences in the loose and thickened tissue reflex of the neuroepithelial layer and limited non-reflective dark area (P<0.05). As *Table 3* shows, there were no statistically

Table 4 Comparison of the OCT indexes and the BCVA and AL among the 4 groups

Groups	Width (μm)	Height (μm)	Distance to the fovea (μm)	CFT (μm)	BCVA (LogMAR)	AL (mm)
AMD (n=34)	3016.36±141.69	441.86±27.01	41.45±4.93	418.84±52.91	0.12±0.04	25.68±2.27
CEC (n=21)	1763.01±131.67	336.49±62.29	17.10±2.56	372.64±31.52	0.22±0.07	24.81±0.87
PM (n=25)	1,403.43±114.41	210.74±21.22	234.44±288.69	250.70±41.36	0.30±0.08	28.48±5.72
ICN (n=14)	1732.59±101.99	305.27±47.37	16.09±3.35	364.34±36.57	0.10±0.05	24.57±0.65
F	924.080	166.570	11.781	73.500	52.412	6.615
P	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

Data are presented as mean ± standard deviation. OCT, optical coherence tomography; AMD, age-related macular degeneration; CEC, central exudative chorioretinopathy; PM, pathological myopia; ICN, idiopathic choroidal neovascularization; CFT, central fovea thickness; BCVA, best corrected visual acuity; AL, axial length; MAR, minimal angle of resolution.

Table 5 Comparison of OCT indexes and the BCVA and AL between the patients with and without macular edema

Groups	Width (μm)	Height (μm)	Distance to the fovea (μm)	CFT (μm)	BCVA (LogMAR)	AL (mm)
With macular edema (n=47)	1,738.43±348.71	305.71±81.22	100.14±236.25	345.65±64.47	0.18±0.10	26.02±2.50
Without macular edema (n=47)	2,493.95±771.53	367.29±107.91	66.98±64.91	365.72±91.87	0.19±0.09	26.11±4.43
t	6.118	3.126	0.928	1.226	0.747	0.115
P	<0.001	0.002	0.358	0.224	0.457	0.909

Data are presented as mean ± standard deviation. OCT, optical coherence tomography; CFT, central fovea thickness; BCVA, best corrected visual acuity; AL, axial length; MAR, minimal angle of resolution.

Table 6 Relationships between OCT indexes and the BCVA and AL

Indexes	Width	Height	Distance to the fovea	CFT
BCVA				
r	−0.635	−0.712	0.241	−0.724
P	<0.001	<0.001	0.019	<0.001
AL				
r	−0.165	−0.244	0.267	−0.275
P	0.112	0.018	0.007	0.007

OCT, optical coherence tomography; BCVA, best corrected visual acuity; AL, axial length; CFT, central fovea thickness.

significant differences in the RPE/subchoriocapillary ridge reflex zone, reflective zone exceeding the RPE tissue, and limited enhanced reflective band between the patients with and without macular edema (P>0.05), but the loose and thickened tissue reflex of the neuroepithelial layer and limited non-reflective dark area rates in those with macular edema were higher than those without macular edema (P<0.05).

OCT indexes and the BCVA and AL

As *Table 4* shows, there were statistically significant differences in the width, height, distance to the fovea, CFT, BCVA, and AL among the groups (P<0.05). As *Table 5* shows, the width and height in patients with macular edema were lower than those without macular edema (P<0.05).

Relationships between the OCT indexes and the BCVA and AL

As *Table 6* and *Figures 1-8* show, there were negative relationships between the width, height, CFT and BCVA (r=−0.635, −0.712, −0.724, P<0.05), and there was a positive relationship between the distance to the fovea and BCVA (r=0.241, P<0.05). There were also negative relationships between the height, CFT, and AL (r=−0.244, −0.275, P<0.05), and there was a positive relationship between the distance to the fovea and AL (r=0.267, P<0.05).

OCT images

Figure 9 shows an OCT image of a MCN patient with

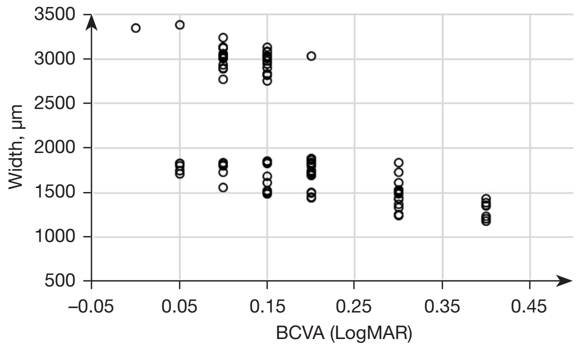

Figure 1 Relationship between width and BCVA. BCVA, best corrected visual acuity; MAR, minimal angle of resolution.

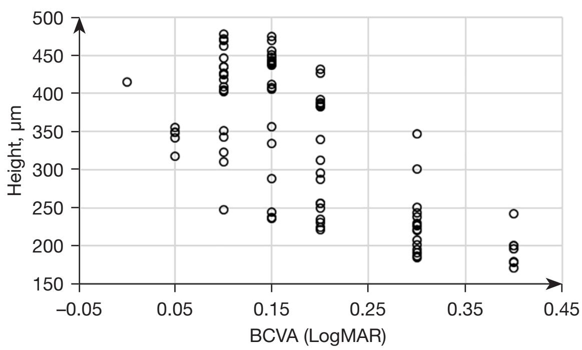

Figure 2 Relationship between height and BCVA. BCVA, best corrected visual acuity; MAR, minimal angle of resolution.

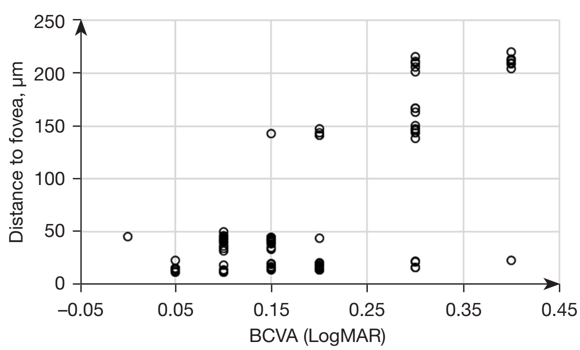

Figure 3 Relationship between distance to the fovea and BCVA. BCVA, best corrected visual acuity; MAR, minimal angle of resolution.

macular edema. More specifically, it shows the RPE/subchoriocapillary ridge reflex zone, reflective zone exceeding the RPE tissue, limited enhanced reflective band, loose and thickened tissue reflex of the neuroepithelial

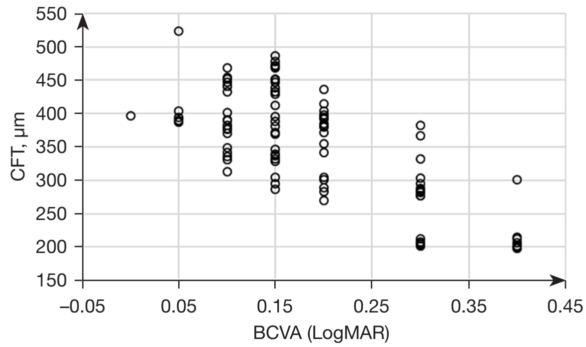

Figure 4 Relationship between CFT and BCVA. CFT, central fovea thickness; BCVA, best corrected visual acuity; MAR, minimal angle of resolution.

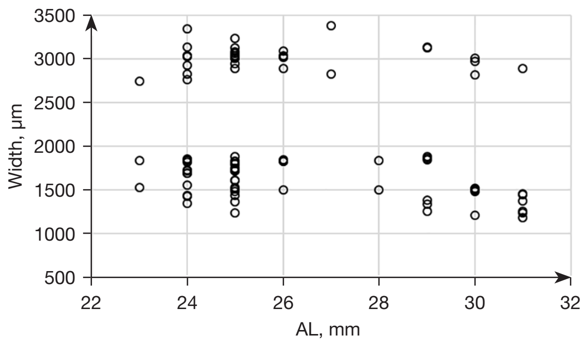

Figure 5 Relationship between width and AL. AL, axial length.

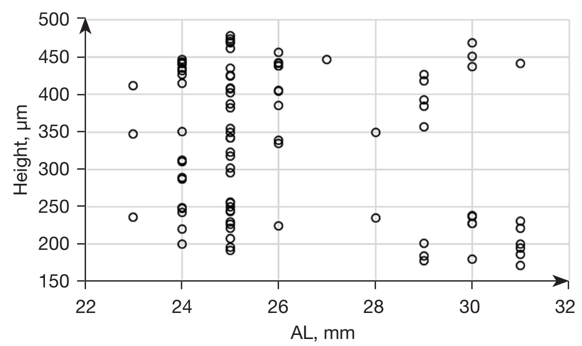

Figure 6 Relationship between height and AL. AL, axial length.

layer, and limited non-reflective dark area. *Figure 10* shows an OCT image of a MCN patient with macular edema, and displays the patient's CFT thickening. *Figure 11* shows an OCT image of a MCN patient without macular edema, and shows the RPE/subchoriocapillary ridge reflex zone, reflective zone exceeding the RPE tissue and limited

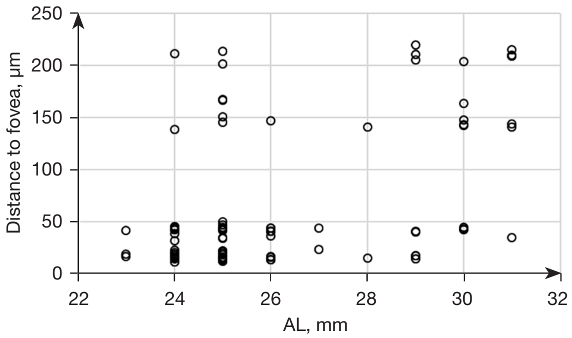

Figure 7 Relationship between distance to the fovea and AL. AL, axial length.

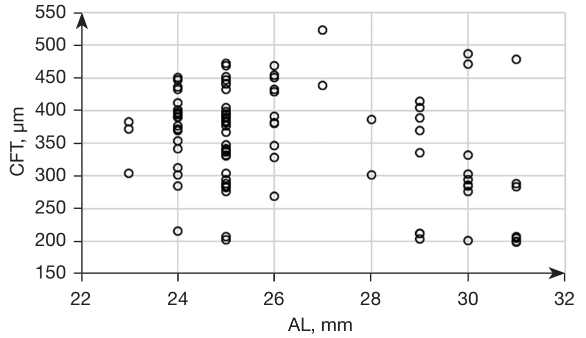

Figure 8 Relationship between CFT and AL. CFT, central fovea thickness; AL, axial length.

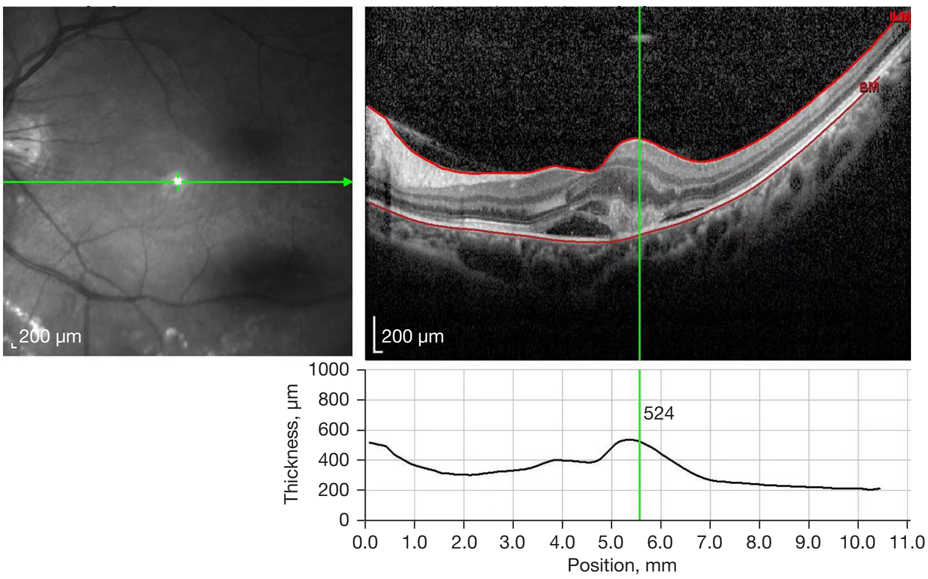

Figure 9 OCT image of a MCN patient with macular edema. OCT, optical coherence tomography; MCN, macular choroidal neovascularization.

enhanced reflective band.

Discussion

Most MCN patients have macular edema symptoms that may be accompanied by vision changes (13). Clinicians need to accurately evaluate patients' vision in a timely manner to enable scientific and reasonable interventions to be implemented to prevent visual impairment (14,15). PM is irreversible and can cause blindness. At present, OCT is the method commonly used to examine the fundus. Thus, an understanding of the relationship between OCT performance, indicators, and vision will not only further develop the clinical value of this examination method but will also help to accurately evaluate the vision of patients (16,17). This working group carried out this study to extend understandings of this relationship.

In the study, no statistically significant differences among the groups were found in terms of gender and age (P>0.05), indicating that the 4 groups in this study were comparable. However, the macular edema proportions were statistically significant in MCN eyes among the four groups (P<0.05). The reason for the statistical difference in the proportion of macular edema in different types of MCN may be related to the differences in the characteristics of different types of diseases. As is well known, CEC is generally monocular,

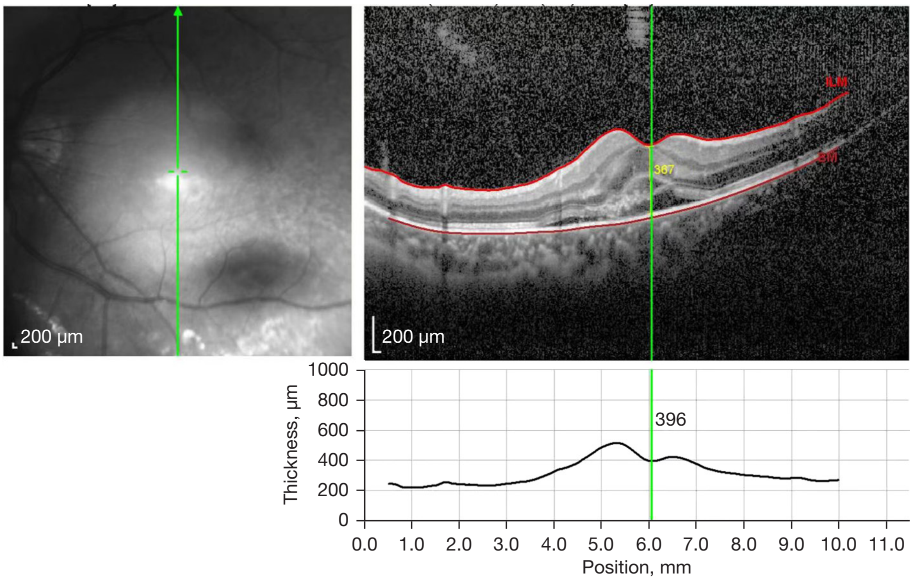

Figure 10 OCT image of a MCN patient with macular edema. OCT, optical coherence tomography; MCN, macular choroidal neovascularization.

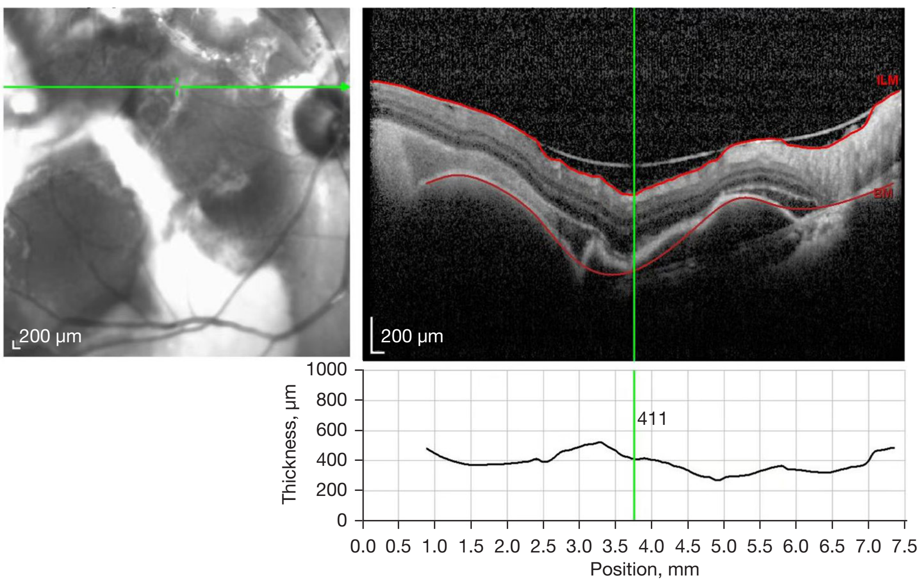

Figure 11 OCT image of a MCN patient without macular edema. OCT, optical coherence tomography; MCN, macular choroidal neovascularization.

but rarely binocular, while AMD, PM, and ICN are mainly monocular diseases, but may also present with binocular diseases (18,19). In MCN patients, 1 eye of the patient is affected first, and the other eye shows symptoms as time goes on. Macular edema refers to edema caused by an inflammatory reaction and fluid infiltration in the macular area of the retina. The macular region is the most sensitive part to light, and macular edema can lead to a significant decline in vision (20). Thus, MCN patients with macular edema need to undergo intensive treatment. As different diseases produce different inflammatory reactions in the macular area, the risk and severity of macular edema also differ. In this study, the AMD patients had the highest proportion of macular edema, which may have been due to low-grade inflammations, gene mutations, ethnic differences, etc.

In addition, this study also found that there were no statistically significant differences in the RPE/subchoriocapillary ridge reflex zone, reflective zone exceeding the RPE tissue and limited enhanced reflective band of the OCT manifestations among the 4 groups (P>0.05). These findings suggest that MCN patients with different primary diseases may all display reflex zone and limited enhanced reflective band on OCT examination. However, statistically significant differences were found in the loose and thickened tissue reflex of the neuroepithelial layer and limited non-reflective dark area (P<0.05), such that the loose and thickened tissue reflex of the neuroepithelial layer and limited non-reflective dark area rates were higher in those with macular edema than those without macular edema (P<0.05). Thus, in the OCT examinations, a loose and thickened tissue reflex of the neuroepithelial layer and limited non-reflective dark area were found to be more common in patients with macular edema, and these manifestations indicate macular edema. In patients with macular edema, due to inflammatory changes and fluid exudation in the macular area, non-reflective dark areas can be clearly observed in OCT images. The loose and thickened tissue reflex of the neuroepithelial layer mainly occurs due to the detachment of the neuroepithelial layer and cystic edema in such patients. In this study, there were significant differences in the loose and thickened tissue reflex of the neuroepithelial layer and limited non-reflective dark area among the groups; however, different OCT manifestations with or without macular edema is also due to the different risk of macular edema in MCN patients with different types of primary diseases.

In addition, this study also found statistically significant differences in the width, height, distance to the fovea, CFT, BCVA, and AL among the groups (P<0.05). Notably, the width, height, CFT and BCVA were the highest in the AMD group, followed by the CEC group and the ICN group, and finally the PM group. However, the distance to the fovea changed in the opposite direction, such that the AL was the highest in the PM group. The reasons for these results are described above.

In the MCN patients, negative relationships were observed between the width, height, CFT, and BCVA (r=−0.635, −0.712, −0.724, P<0.05), but a positive relationship was observed between the distance to the fovea and BCVA (r=0.241, P<0.05). Additionally, negative relationships were observed between the height, CFT, and AL (r=−0.244, −0.275, P<0.05), and a positive relationship was observed between the distance to the fovea and AL (r=0.267, P<0.05). Thus, the OCT indexes were found to be related to the vision of patients with MCN. Clinicians can use OCT results to understand the visual changes of MCN patients and those of other patients (except for those with PM). In fact, a considerable number of AMD, CEC, and ICN patients with vision loss need to be treated symptomatically. In addition, and similar to the findings of Nowilaty (21), most MCN patients in this study, had impaired vision.

MCN can be secondary to a variety of fundus diseases with a variety of manifestations. Patients with a rapid onset and high macular edema can often recover their vision quickly. Conversely, patients with a slow onset and recurrent choroidal hemorrhages usually recover slowly and often have impaired visual function. In this study, it is worth noting that in the PM group, due to the long AL, the thickness of the retina per unit area may be thinner than that of a normal AL, and the photoreceptor density may be reduced. MCN is often located in the paracenter and is accompanied by atrophy and scarring. The linear relationship between the fundus indexes and vision is relatively weak. Due to their poor vision, patients with PM tend to visit their doctor only when their vision has decreased significantly.

As a non-invasive and highly accurate examination method, OCT can detect small changes in the macular region in a timely manner, and thus plays an important role in guiding clinicians in the diagnosis and treatment of patients, which in turn can reduce or prevent further vision loss in PM patients. Moreover, there is usually vitreous hemorrhage in MCN patients, and it is often difficult to obtain satisfactory OCT images of vitreous opacity. In such patients, pars plana vitrectomy surgery needs to be conducted in a timely manner to remove the accumulated blood to save the patient's visual function. After the operation, regular OCT examinations should be conducted to monitor the absorption of any choroidal hemorrhages. As choroidal hemorrhages absorb, patients are usually able to regain some of their visual function.

This study examined Asian MCN patients. Thus, further research needs to be conducted before it can be concluded that these results apply to patients in other regions. Our research team intends to conduct further research in the future to verify the reliability of the results and gather more evidence.

Conclusions

The OCT examinations showed that most of the MCN patients had the following manifestations: RPE/subchoriocapillary ridge reflex zone, a reflective zone exceeding the RPE tissue and limited enhanced reflective band. Notably, patients with different diseases had the above manifestations, but patients with macular edema often had a loose and thickened tissue reflex of the neuroepithelial layer and a limited non-reflective dark area. In MCN patients, the OCT indexes change, and the BCVA and AL in PM patients were higher than the AMD, CEC and ICN, Most of the OCT indexes were related to the BCVA and AL in the MCN patients. Clinicians can assess the disease type of MCN patients according to the OCT manifestations and quantitative indicators, determine the existence of macular edema and evaluate changes in vision. The findings of this study offer guidance to clinicians.

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Footnote

Reporting Checklist: Both authors have completed the STROBE reporting checklist. Available at https://atm.amegroups.com/article/view/10.21037/atm-22-5917/rc

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Conflicts of Interest: Both authors have completed the ICMJE uniform disclosure form (available at https://atm.amegroups.com/article/view/10.21037/atm-22-5917/coif). Both authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). The study was approved by the ethics board of the First Affiliated Hospital of Zhengzhou University (No. 2021-KY-0423-001) and informed consent was taken from all the patients.

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