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Evaluation of a self-imaging OCT for remote diagnosis and monitoring of retinal diseases

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Synopsis

This study validates the accuracy and feasibility of a self-imaging OCT in measuring central subfield thickness and identifying retinal lesions, showing the potential for home monitoring or screening of retinal diseases.

Abstract

Objectives To evaluate the feasibility and accuracy of a portable, self-imaging optical coherence tomography (OCT) for measuring central subfield thickness (CST) and achieving diagnostic concordance for retinal lesions compared to clinic-based spectral-domain OCT (SD-OCT).

Methods This comparative, cross-sectional study was conducted between August 2020 and February 2021. Two groups of adult participants were recruited: (1) a selected cohort of 160 participants with confirmed diagnosis, and (2) a consecutive cohort of 315 participants recruited randomly. All participants underwent self-imaging OCT examination, as well as standard OCT examination. CST was automatically calculated for comparisons between the two OCT devices. Diagnostic concordance for retinal lesions and the success rate of self-imaging were assessed within the consecutive cohort.

Results In the selected cohort, self-imaging OCT images yielded consistent CST with SD-OCT, with a mean difference of 0.1 ± 7.7μm for normal eyes, 4.9 ± 10.6 μm for macular edema, -1.3 ± 9.5 μm for choroidal neovascularization, 5.0 ± 7.8 μm for epiretinal membrane. The self-imaging OCT also demonstrated good repeatability, with a mean test-retest difference in CST of 0.7 ± 3.9 μm and limits of agreement (LOA) ranging from -6.9 to 8.3 μm. Additionally, within the consecutive cohort, inter-device κ values ranged for detecting various retinal lesions ranged from 0.8 to 1.0, except in the cases of retinal detachment (κ = 0.5). All eyes (100%) in the selected cohort and 242 eyes (76.8%) in the consecutive cohort successfully completed self-imaging. Participants spent less time on self-imaging compared to SD-OCT operated by a technician (66 vs. 73 seconds, $p < 0.01$). A majority of participants (90%) found the self-imaging process "easy" and "comfortable".

Conclusions and Relevance The present study demonstrates that our self-imaging OCT and clinic-used SD-OCT are highly consistent not only in measuring the central subfield thickness but also in identifying most retinal lesions.

Key Messages

What is already known on this topic?

OCT plays a crucial role in screening, diagnosing, and routine monitoring of retinal diseases. However, the accessibility of OCT machines is often restricted to hospitals or clinics, which requires patients frequently visit for these facilities. Moreover, the reliance on human operation poses a burden on the healthcare system for screening and diagnosis. To address these limitations, we have developed a lightweight, portable, and self-imaging OCT machine, but it is important to validate its accuracy and feasibility.

What this study adds?

In this comparative cross-sectional study including patients with retinal diseases, our self-testing OCT device demonstrated strong agreement with the standard SD-OCT in both measuring central subfield thickness and diagnosing retinal lesions. Furthermore, the self-imaging process exhibited an acceptable completion rate.

How this study might affect research, practice or policy?

With the added convenience of door-to-door delivery service, our self-imaging OCT device will significantly enhance the availability and accessibility of OCT for routine monitoring of central subfield thickness in conditions such as diabetic macular edema (DME), as well as facilitate remote imaging of retinal diseases in the comfort of patients' homes.

Introduction

Optical Coherence Tomography (OCT) is the primary imaging modality used for screening, diagnosing, and routine monitoring of vision-threatening retinal diseases,(1) including age-related macular degeneration (AMD)(2) and diabetic macular edema (DME).(3) Regular evaluation of central subfield thickness (CST) using OCT is imperative, especially for patients necessitating frequent intravitreal anti-vascular endothelial growth factor (anti-VEGF) injections,(2, 4) to optimize treatment outcomes. CST in OCT images primarily determines the response to treatment and the need for extra injections.(4, 5) Furthermore, the integration of OCT shows the potential to enhance the remote screening and diagnosis of retinal diseases.(6, 7)

Despite their important role in retinal diseases management, OCT machines are typically bulky desktop instruments only available in dedicated rooms within eye centers, hospitals or clinics, involving trained ophthalmic technicians for their operation.(1) These limitations inevitably resulting in patients being required for frequent hospital/clinic visit to undergo OCT imaging, thereby exerting a substantial burden on them, including the time and indirect expenses associated with transportation and caregiver availability, as well as the inconvenience of numerous visits.(2, 8) Such challenges can easily lead to non-adherence or non-persistence with follow-up visits and treatment regimen.(9, 10)

Rather than requiring patients to frequently visit hospital/clinic, we proposed a home-based eye care model called "Express Medicine," which involves sending OCT machines to patients' residences via established courier networks.(11) Such a model has the potential to overcome the barriers of hospital visits in terms of space and time, bringing significant benefits to patients, including greater access to under-served populations and reduced travel time and cost burdens. The primary prerequisite is to overcome the limitations of workspace and operation for OCT. We

have developed a lightweight, portable, and self-imaging OCT device (**Figure 1**), equipped with scanning parameters comparable to those in commercial desktop OCT machines. This self-imaging OCT enables patients to capture high-resolution retinal OCT images from the comfort of their homes, subsequently transmitting these images to healthcare providers in remote settings. With door-to-door delivery service, our self-imaging OCT will expand the role of OCT in routine monitoring of CST and remote imaging of retinal diseases at home.

The aim of this pilot study was to evaluate the accuracy, repeatability, and feasibility of our self-imaging OCT device in two possible application scenarios: remote measurement of CST, and remote diagnosis of various retinal lesions. We used the commercially available Spectral Domain Optical Coherence Tomography (SD-OCT), which is a widely accepted and established imaging technique in clinical practice, as the reference standard.

Methods

Ethical approval

This study was approved by the Ethical Review Committee of the Zhongshan Ophthalmic Center (approval ID: 2020KYPJ201) and was conducted in accordance with the tenets of the Declaration of Helsinki. Written informed consent was obtained from all participants who were enrolled between August 2, 2020, and February 13, 2021.

Study design and setting

We conducted a comparative, cross-sectional study at the Zhongshan Ophthalmic Center (ZOC), Sun Yat-sen University, China. We recruited two cohorts of patients from the Retina Clinic, including the selected and the consecutive cohorts (**Figure 2**). The selected cohort comprised patients with confirmed retinal disease to assess the accuracy and repeatability of our device in quantifying CST. The consecutive cohort consisted of patients randomly recruited from the retinal clinic to evaluate the feasibility and diagnostic accuracy of our device in detecting retinal lesions.

In the selected cohort, eligible participants were 18 years of age or older and had a confirmed diagnosis of choroidal neovascularization (CNV), macular edema (intraretinal fluid, ME) or epiretinal membrane (ERM) in one or both eyes, as determined by two retina specialists (S.C. and Z.L.). Normal participants were also included in the selected cohort, with best corrected visual acuity (BCVA) $\geq$ 20/40 and no signs of ocular disease. Exclusion criteria were BCVA < 20/200 in the better eye (to prevent fixation failure), spherical equivalents $\leq$ -12 diopter (D), or Lens Opacities Classification System III posterior subcapsular opalescence grade $\geq$ 3.0.(12) In the consecutive cohort, we randomly enrolled patients who needed OCT examinations, diagnosed by the two retina specialists through review of their ophthalmic records. Complicated cases (e.g., those with low vision, severe cataract, or high myopia) were also recruited. Exclusion criteria were any severe diseases or conditions

preventing participants from participating and providing informed consent (e.g., cognitive diseases).

OCT examination and participant survey

All participants underwent OCT imaging with both the self-imaging OCT and the SD-OCT (Spectralis, Heidelberg Engineering, Germany) on the same day.

Our self-imaging OCT is a prototype device with a smaller size (L362 × W425 × H438 mm) and a lighter weight (20 kg) compared to the desktop SD-OCT (**Figure 1**). The self-imaging OCT employed an infrared light source with a wavelength of 840 nm, an axial resolution of 5 μm, an imaging area of 12 × 8 mm and a scan speed exceeding 80,000 A-scans per second. The self-imaging was conducted in a separate examination room within the clinic to simulate a home environment. Before imaging, each participant read the instruction manual and viewed a 2-minute video tutorial. Subsequently, practical instructions on device usage were provided to help participants develop the proficiency with self-imaging. After the initial training, participants were then left alone in the room to undergo the self-imaging. Guided by step-by-step voice instructions from the device, they were asked to position their head on the headrest properly, focus directly on the internal fixation target generated by the self-adjusting sensor and avoid blinking during imaging. The default scanning pattern consisted of 6 radial, concentric, and 6-mm-long B-scans centered on the fovea. In instances where participants failed to comply, the equipment prompted them to repeat the imaging process, affording them up to three attempts. Both eyes were imaged, and we recorded the outcome (success or failure), the underlying reasons for failure, and the duration of the self-imaging process. A subset of 20 normal participants was invited to repeat the self-imaging OCT after a 10-minute interval to assess the repeatability.

The standard SD-OCT examination was performed by an experienced technician.

The scanning pattern comprised a raster of 19 horizontal line scans with a scan density of 512 A-scans per line, averaging 9 iterations, and 9-mm-long B-scans centered on the fovea. Imaging was performed for both eyes, and the duration was recorded.

To further assess the feasibility, all participants in the consecutive cohort were invited to survey about their perceptions and preferences regarding to self-imaging. The non-validated questionnaire consisted of four statements, using a 5-point scale, with 1 indicating strongly agree; 3, uncertain; and 5, strongly agree (Supplemental Table 3).

Image Grading

Representative images from both OCT devices are shown in **Figure 1**. All OCT images were deidentified and independently graded by the two retina specialists (S.C and Z.L.). The final grading was achieved by consensus, and a third senior specialist (X.L.) was consulted if disagreement arose. Separate grading was performed for SD-OCT and self-imaging OCT images of the same eye. OCT images were considered uninterpretable if the macula could not be clearly identified or if they exhibited extremely poor quality. OCT images were graded according to the presence of various lesions including ERM, ME, CNV, retinal detachment, macular holes, and any other abnormal retinal findings.(13) Some images might have more than one kind of retinal lesion. Only eyes that have interpretable images from both types of OCT devices were included in the statistical analysis.

Measurement of the Central Subfield Thickness (CST)

Automated image segmentation for both SD-OCT and the self-imaging OCT was executed using the SD-OCT software (Heidelberg Eye Explorer version 6.0.9.0) and the proprietary software for the self-imaging OCT, respectively. Software-generated CST, defined as the distance between the inner limiting membrane and the lower

border of the retinal pigment epithelium, was assessed. No manual adjustments were applied to the automated image segmentation process. The automated annotation of retinal boundaries was further reviewed by the two retina specialists. Images displaying segmentation failure and eyes with macular holes were excluded from the analysis of CST.

Statistical analysis

For the comparison in the agreement of CST, a sample size of 30 eyes for each group of retinal lesion would yield a two-sided 95% confidence interval (CI) with a width of 0.08 when the Pearson's product-moment correlation estimate is 0.950. Continuous variables were described as means and standard deviations (SDs), while categorical variables were presented as counts and percentages. Only the right eye was chosen for statistical analysis for normal participants and patients with retinal diseases in both eyes, otherwise the only affected eye was selected. We used Bland-Altman analysis and Pearson's correlation analysis to evaluate the agreement of CST measurements between the two OCT devices, as well as the repeatability. The mean difference was calculated by subtracting the mean thickness of the SD-OCT measurements from those of the self-imaging OCT, while the limits of agreement (LOA) were determined as the mean differences plus or minus 1.96 times the standard deviations. All results were reported with 95% CIs. From a clinical perspective, acceptable LOA values were predefined as ± 20 μm in the selected cohort and ± 30 μm in the consecutive cohort. The test-retest reliability (TRR) of the self-imaging OCT was also calculated.

Cohen's κ test was used to evaluate the diagnostic concordance between the two OCT devices, following the grading system of Landis and Koch.(14) Paired t-tests were employed to compare the time required for examination completion using the two OCT devices. We performed all statistical analyses using Stata Statistical Software 16 (StataCorp., TX, USA), and findings were considered significant at $p <$

247 0.05.

248

Results

This study included 160 eyes from 160 participants in the selected cohort and 315 eyes from 315 participants in the consecutive cohort. For the selected cohort, the mean (SD) age was 58.3 (12.6) years and 93 participants (58.1%) were female. For the consecutive cohort, the mean (SD) age was 56.5 (13.3) years and 179 participants (56.8%) were female. The detailed demographic information is shown in **Supplemental Table 1**.

In the selected cohort, we aimed to assess the accuracy and repeatability of measuring CST. All the 160 participants (100%) successfully completed self-imaging and yielded interpretable images from both OCT devices. **Table 1** shows the comparison results in CST measurement. The mean (SD) difference in CST between the two OCT devices was 0.1 (7.7) μm (95% LOA, -15.0 to 15.1μm) for normal eyes, 4.9 (10.6) μm (95% LOA, -15.9 to 25.6 μm) for eyes with ME, 5.0 (7.8) μm (95% LOA, -19.9 to 17.4 μm) for eyes with ERM, -1.3 (9.5) μm (95% LOA, -10.3 to 20.2 μm) for eyes with CNV.

In the consecutive cohort, we aimed to evaluate the feasibility of implementing self-imaging OCT in a real-world clinic setting (**Supplemental Table 2**). Among the 315 participants, 45 out of them (14.3%) failed self-imaging. The main reasons for unsuccessful self-imaging included an inability to maintain fixation on the internal target (36 out of 315, 11.4%) and an inability to operate the self-imaging OCT device by themselves (9 out of 315, 2.9%). Among those who completed the self-imaging process, 10.4% of them (28 of 270) obtained images classified as uninterpretable. This was primarily due to issues related to image quality (20 out of 28, 71.4%) and macular region not captured in the image (8 out of 28, 28.6%). Out of the remaining 270 eyes, 242 (89.6%) yielded interpretable images from both the reference SD-OCT and the self-imaging OCT for the identification of retinal lesions, and 213 of these (78.9%) provided valid CST measurements.

For the 213 eyes in the consecutive cohort, the self-imaging OCT and the SD-OCT showed a mean (SD) difference of 2.0 (9.4) μm (95% LOA, -16.4 to 20.4μm) in CST measurements. Correlation coefficients ranging from 0.948 to 0.999 indicated a strong and consistent correlation in CST measurements across both OCT devices in both cohorts. Regarding the self-imaging OCT, the TRR in CST measurement exhibited a mean (SD) of 0.7 (3.9) μm, with a range from -7 to 7 μm and the 95% LOA from -6.9 to 8.3 μm. **Figure 3** illustrates the Bland Altman plots for the agreement between both OCT devices in measuring CST for both cohorts and the TRR.

Substantial agreement was observed in identifying most retinal lesions between the standard SD-OCT and the self-imaging OCT (**Table 2**), including ERM (κ = 0.9), macular edema (κ = 0.9), CNV (κ = 0.9), macular holes (κ = 1.0), atrophy of choroid (κ = 0.96), subretinal fluid (κ = 0.86) and atrophy of retinal out layer (κ = 0.93). However, the diagnostic agreement for retinal detachment was just moderate (κ = 0.50).

Overall, participants were satisfied with the self-imaging OCT. The questionnaire received responses from 270 participants (86.0%). Of the respondents, 89% “strongly agree” or “agree” with statements about the simplicity and comfort of operating the self-imaging device. Additionally, 73% were willing to choose this instrument for future monitoring, while 69% found it faster than the commercial SD-OCT device. The questionnaire response about the self-imaging OCT is shown in **Supplemental Table 3**. The mean (SD) scanning time of the self-imaging OCT was 66.7 (20.1) seconds per eye, which was significantly faster than that of the SD-OCT (73.3 [32.5] seconds per eye, $p < 0.05$).

Discussion

The aim of this proof-of-concept study was to evaluate the accuracy, repeatability, and feasibility of a self-imaging OCT device in quantifying central subfield thickness and identifying abnormal retinal lesions. Firstly, our results demonstrated that most patients were able to operate the self-imaging OCT device and successfully capture high-quality images of their own eyes. Secondly, the self-imaging OCT provided accurate and repeatable measurements of CST. Thirdly, substantial agreement was observed between both types of OCT in identifying most retinal lesions. These findings support the potential of the self-imaging OCT to facilitate home-based management and screening of retinal diseases.

Our self-imaging OCT device is designed to serve as a portable and automated home OCT for self-imaging. Maloca et al. reported on a sparse OCT prototype for home-based monitoring, which was tested in only a limited group of patients with AMD.(15) This early prototype, with its limited imaging capabilities, necessitates operators and lacks automatic analysis software. Kim et al. introduced another novel home OCT device, the Notal Vision Home OCT (NVHO), which exhibits improved imaging capabilities and automation.(16) However, the application of NVHO or other home OCT devices is confined due to their relatively small imaging area and low scanning speed, limiting their utility in the detection and measurement of macular fluid.(16-18) In contrast, our self-imaging OCT device is equipped with scanning parameters comparable to those of the commercial desktop SD-OCT, conferring great advantages not only in the monitoring macular thickness but also in the screening and diagnosis of most retinal diseases.

One of the most promising applications of this self-imaging OCT device lies in its ability to facilitate home-based monitoring of CST in patients receiving anti-VEGF therapy.(19) When compared to the commercial SD-OCT, our self-imaging OCT achieved excellent agreement in CST measurements. The mean difference in groups

of eyes affected by common retinal diseases remained within ±5 μm (SD ± 11 μm), with the range of difference within ±30 μm. These results were superior to the previous study about the sparse OCT (SD ± 20 μm; the range, 65.6 to 41.5 μm).(15) Moreover, the robust correlation coefficients also suggested the high consistency and reproducibility of CST measurements for our self-imaging OCT. The growing number of patients with DME or AMD who are required to be closely monitored after injection poses an increasing burden on healthcare systems, warranting automated solutions to alleviate monitoring burdens.(20, 21) Our self-imaging OCT holds the potential not only to integrate into home-based eye care programs, but also to be incorporated into the proposed ‘Express Medicine’ eye care model.

Our self-imaging OCT offers a distinctive advantage by providing OCT images with a larger field of view and higher resolution when compared to other home OCT devices. This study demonstrated that substantial agreement in identifying most retinal lesions using our self-imaging OCT, supporting its application in remote retinopathy screening or diagnosis in communities or homes. Pivotal studies have demonstrated that incorporating OCT for DME screening could reduce false positives, improve sensitivity, and exhibit cost-effectiveness when compared to sole fundus photography.(6) Combining fundus photography and OCT for remote retinal diagnosis imaging has been shown to be comparable to traditional dilated eye examinations performed by retinal specialists in clinics.(7) Additionally, OCT shows potential for early glaucoma detection(22) or progression monitoring.(23) However, all the previous studies proposed to use the heavy, expensive, and desktop OCT devices that require trained operators for screening or remote diagnosis, which significantly raises the direct medical cost and imposes a burden on healthcare systems. Our portable, low-cost, self-imaging OCT provides an automated solution to alleviate the screening task and enhance the screening efficacy for retinopathy and even glaucoma.

Assessing the self-operability of our self-imaging OCT device in patients with retinal disease is a critical step in planning its clinical application. A previous study demonstrated that 80-90% of AMD patients (with VA ≥ 20/400) completed self-imaging using NVHO 2.5 and 3.0 in clinic.(16) In our study, all eyes of AMD or DME participants (VA ≥ 20/200) successfully completed self-imaging and obtained interpretable images using our self-imaging OCT device. Moreover, our study is the first study to evaluate the feasibility of applying self-imaging OCT device in the real-world clinic setting, where patients often present with more complicated conditions. Our survey received positive feedback from patients regarding the device's usability, with a majority finding it easy to use and comfortable during testing.

Limitations and strengths

The main limitation of this study lies in the absence of field testing the device in patients' own homes. Despite the self-imaging OCT device‘s intended robustness and lightweight design to ensure autonomous service provision to patients without supervision, and although it was tested in a separate room simulating a home environment, further investigations at home are still needed. Moreover, it is important to note that the self-imaging OCT and SD-OCT devices use different scanning patterns, which may have contributed to the divergence in retinal thickness measurements.

Conclusions

Our findings suggest that the self-imaging OCT device performs comparably to conventional SD-OCT in detecting pathological findings and measuring macular thickness. However, it is important to note that further research is warranted to determine the feasibility of using self-imaging OCT outside of clinical settings, including real home monitoring.

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Author Contributions: Drs Y.Z. Liu and S.D. Chen had full access to all data in the study and are responsible for the integrity of the data and the accuracy of the data analysis. Concept and design: Y.Z. Liu, Zheng, and Chen. Acquisition, analysis, or interpretation of data: All authors. Drafting of the manuscript: Chen, Z.T. Liu, Zheng. Critical revision of the manuscript for important intellectual content: All authors. Statistical analysis: Z.T. Liu, Chen, Jin, Zheng. Administrative, technical, or material support: W.Y. Huang. Supervision: Y.Z. Liu.

Conflict of Interest Disclosures: Drs. Y.Z. Liu and Zheng reported that they hold patents on the self-imaging device used in this study, and on the automated imaging analysis system associated with the imaging software used in this study. No other disclosures were reported.

Data and Materials Availability: All data necessary to assess the conclusions of the paper are present in the paper or in the Supplemental Materials.

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Table 1. Mean difference, SD and LOA for Bland-Altman analyses and Pearson's correlation analysis results of central subfield thickness (CST) for the selected cohort.

Cohorts	No.	SD-OCT (Mean [SD])	Self-imaging OCT (Mean [SD])	Mean Difference (95% CI)	SD (95% CI)	LOA (95% CI)		Range	Correlation Coefficient (95% CI)
						Lower	Upper		
The selected cohort									
Normal	50	218.2 (24.0)	218.3 (23.5)	0.1 (-2.1, 2.3)	7.7 (6.4, 9.6)	-15.0 (-18.7, -11.2)	15.1 (11.4, 18.9)	(-14, 19)	0.948 (0.910, 0.970)
Macular edema	40	361.3 (177.4)	366.2 (180.4)	4.9 (1.5, 8.3)	10.6 (8.7, 13.6)	-15.9 (-21.7, -10.0)	25.6 (19.8, 31.5)	(-19, 23)	0.998 (0.997, 0.999)
CNV	30	330.7 (188.2)	329.5 (183.7)	-1.3 (-4.8, 2.3)	9.5 (7.6, 12.8)	-19.9 (-26.1, -13.8)	17.4 (11.3, 23.5)	(-18, 26)	0.999 (0.998, 1.000)
ERM	40	359.1 (126.5)	364.1 (127.4)	5.0 (2.5, 7.5)	7.8 (6.4, 10.0)	-10.3 (-14.5, -6.0)	20.2 (15.9, 24.5)	(-9, 22)	0.998 (0.996, 0.999)
The consecutive cohort	213	283.9 (142.9)	285.9 (144.4)	2.0 (0.8, 3.3)	9.4 (8.6, 10.4)	-16.4 (-18.5, -14.2)	20.4 (18.3, 22.6)	(-19, 26)	0.998 (0.997, 0.998)

Abbreviations: CNV: choroidal neovascularization; ERM: Epiretinal membrane; SD: standard deviation; LOA: limits of agreement; CI: confidence interval; SD: standard deviation; SD-OCT: spectral-domain optical coherence tomography; no, number.

Table 2. Diagnostic concordance between the SD-OCT and self-imaging OCT images from the consecutive cohort

	SD-OCT	Self-imaging OCT	Rate	Kappa value
Normal	84	81	96.4%	0.9
Epiretinal membranes (ERM)	56	50	89.3%	0.9
Macular edema (intraretinal fluid, ME)	50	43	86.0%	0.85
Choroidal neovascularization (CNV)	23	21	91.3%	0.90
Macular hole (MH)	17	17	100.0%	1
Atrophy of choroid (AC)	15	14	93.3%	0.96
Subretinal fluid (SF)	11	10	90.9%	0.86
Atrophy of retinal out layer (ARO)	8	7	87.5%	0.93
Abnormal of IS/OS (AS)	7	7	100.0%	0.82
Retinoschisis (RS)	2	2	100.0%	0.80
Retinal detachment (RD)	2	1	50.0%	0.50

Abbreviations: SD-OCT: spectral-domain optical coherence tomography.

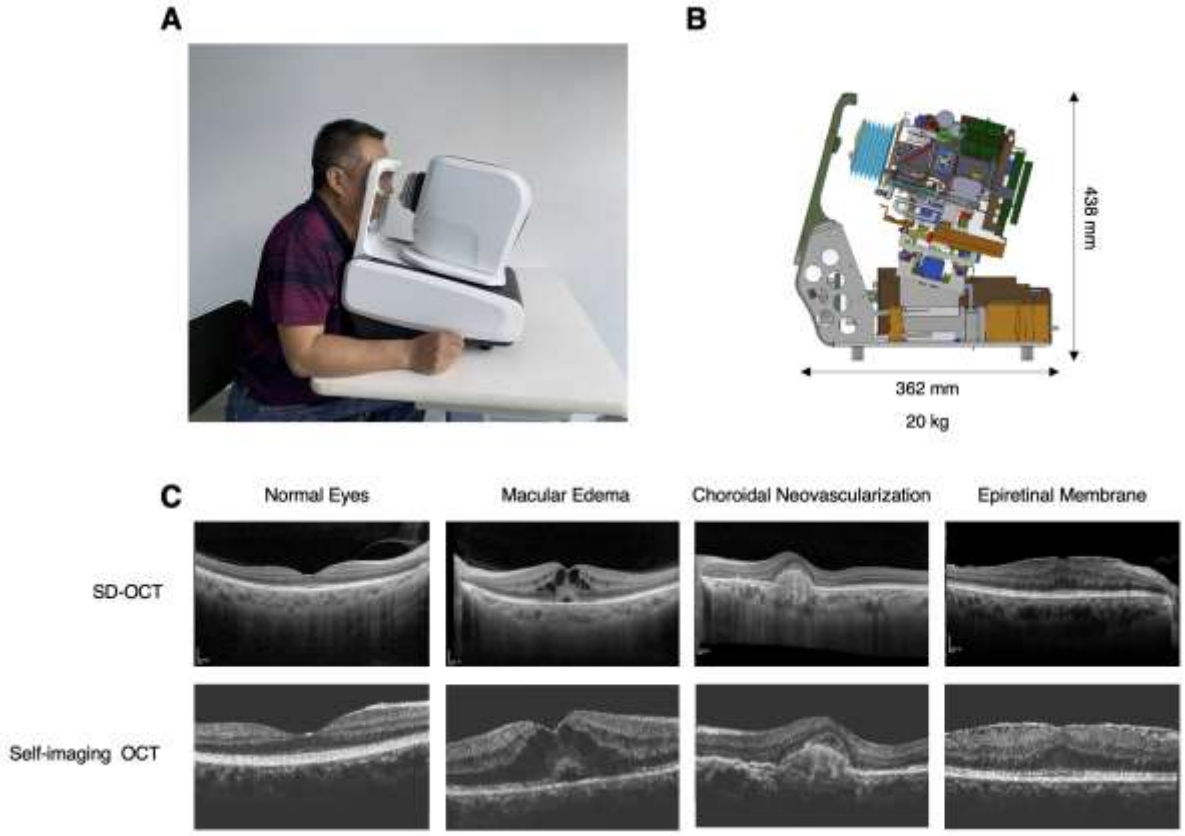


Figure 1. Illustration and performance of the self-imaging optical coherence tomography (OCT) device. **(A, B)** Illustration of the compact design. **(C)** Comparison of OCT images from the spectral-domain OCT (SD-OCT) and self-imaging OCT (the same eye for each column). OCT images of normal eyes and eyes with macular edema, choroidal neovascularization, or epiretinal membrane.

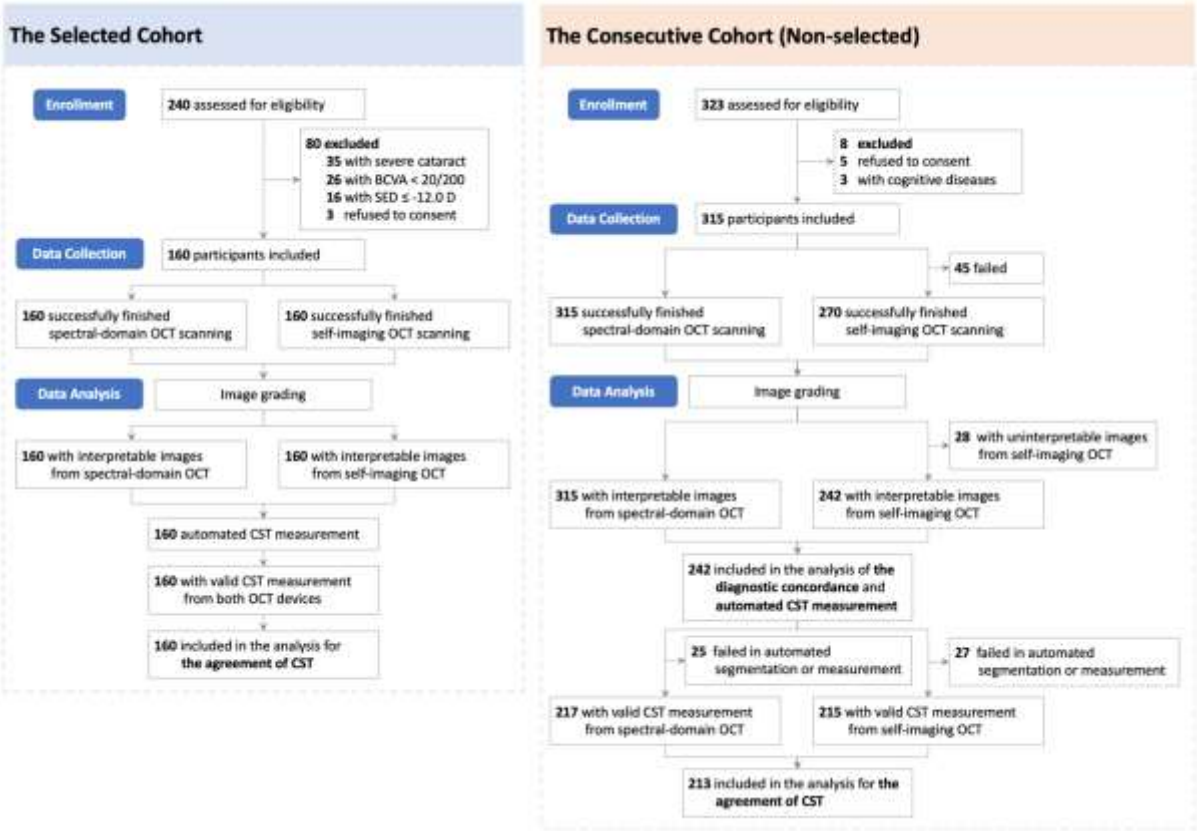
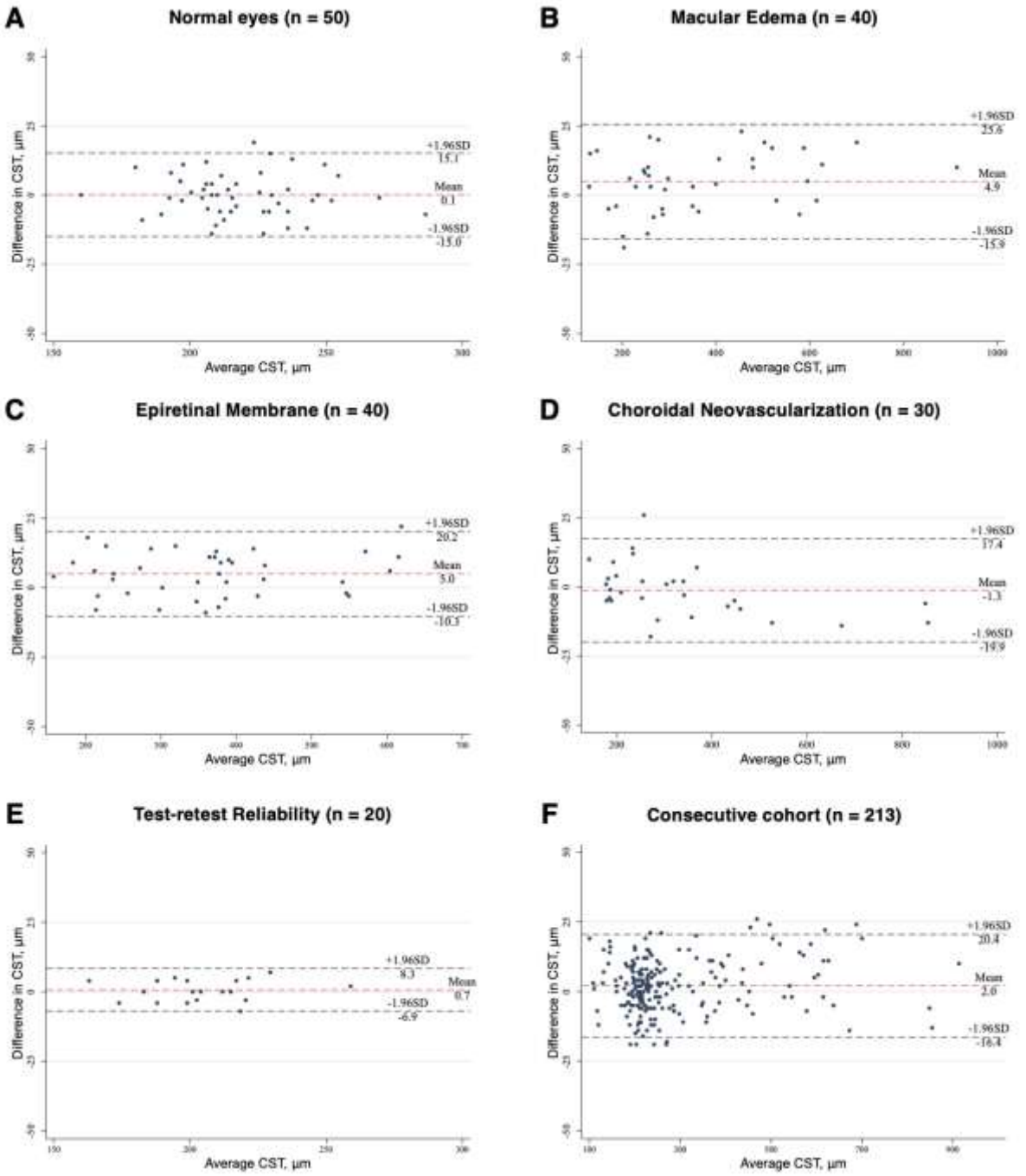


Figure 2. Flow chart of the selected and the consecutive (non-selected) cohorts in this study.

Abbreviations: SD-OCT: spectral-domain optical coherence tomography; CST, central subfield thickness.



513 **Figure 3.** Bland Altman plot of central subfield thickness (CST) measurements. **(A-**
514 **D)** CST measurements by spectral-domain optical coherence tomography (SD-OCT)
515 and self-imaging OCT in participants of the selected cohort in normal eyes, eyes with
516 macular edema, choroidal neovascularization (CNV) or epiretinal membrane,
517 respectively. **(E)** Test-retest reliability in 20 normal eyes. **(F)** CST measurements by
518 the two types of OCT in eyes with valid CST in the consecutive cohort. Black dashed
519 horizontal lines: 95% limits of agreement (LOA). Red dashed horizontal lines: mean

differences between measurements.

Supplemental Materials

Supplemental Table 1. Baseline characteristics of the participants in the two cohorts.

Cohorts	No.	Age (mean [SD])	Sex, (female, no [%])
The selected cohort			
Normal	50	56.9 (14.5)	32 (64.0%)
Macular edema*	40	55.0 (10.9)	20 (50.0%)
CNV#	30	61.8 (13.8)	17 (56.7%)
Epiretinal membrane	40	60.8 (11.2)	24 (60.0%)
The consecutive cohort	315	57.0(13.1)	181 (57.5%)

*Macular edema: secondary to diabetic retinopathy or retinal vein occlusion

#CNV: choroidal neovascularization secondary to age related macular degeneration, myopic macular neovascularization or idiopathic

Supplemental Table 2. Performance of the two OCT devices in the consecutive cohort.

Categories	No. (n / N [%])	
	Self-imaging OCT	SD-OCT
Total participants	**315**	
Failed the self-imaging	45 / 315 (14.3%)	N/A
Not able to operate the device by themselves	9 / 315 (2.9%)	N/A
Not able to fixate on the target	36 / 315 (11.4%)	N/A
Completed the self-imaging	270 / 315 (85.7%)	N/A
Included in the image grading	**270**	
With uninterpretable images	28 / 270 (10.4%)	N/A
Images with poor quality	20 / 270 (7.4%)	N/A
Macular region not captured	8 / 270 (3.0%)	N/A
With interpretable images	242 / 270 (89.6%)	315 / 315 (100%)
Included in the diagnosis concordance analysis and segmentation	**242**	
Failed in the automated segmentation	10 / 242 (4.1%)	8 / 242 (3.3%)
Segmentation error	1 / 242 (0.4%)	1 / 242 (0.4%)
No segmentation	9 / 242 (3.7%)	7 / 242 (2.9%)
Excluded due to macular holes	17 / 242 (7.0%)	17 / 242 (7.0%)
With valid CST	215 / 242 (88.8%)	217 / 242 (89.7%)
With valid CST from both devices	**213**	

Abbreviations: SD-OCT: spectral-domain optical coherence tomography; CST: central subfield thickness; N/A, not applicable

Supplemental Table 3. Subjective assessments of self-imaging OCT in the consecutive cohort.

	Strongly agree	Agree	Uncertain	Disagree	Strongly disagree
The tasks to scan my eye using the self-testing OCT were easy to perform.	67%	22%	5%	6%	0%
I felt comfortable during the self-imaging.	72%	17%	5%	5%	1%
The time for self-testing was shorter than the one for conventional OCT.	35%	34%	8%	18%	5%
I prefer to use self-testing OCT to scan my eye when needed next time.	43%	30%	8%	16%	3%

Abbreviations: OCT, optical coherence tomography.