Illustrated Glaucoma Case Presentation

Illustrated Glaucoma Case Presentation:

A Guide for Daily Practice

By

Naveed Nilforushan
and Navid Abolfathzadeh

Cambridge
Scholars
Publishing

Illustrated Glaucoma Case Presentation: A Guide for Daily Practice

By Naveed Nilforushan and Navid Abolfathzadeh

This book first published 2024

Cambridge Scholars Publishing

Lady Stephenson Library, Newcastle upon Tyne, NE6 2PA, UK

British Library Cataloguing in Publication Data
A catalogue record for this book is available from the British Library

ISBN (10): 1-0364-0517-6
ISBN (13): 978-1-0364-0517-5

Dedicated to

All who are involved in the care of glaucoma patients with commitment and love.

My beloved wife and children

Naveed

My beloved ones; Roghi, Saeed, Zoli, Farhoud, and Noyan

in appreciation for their dedications, understanding and endless kindness.

My big-hearted father and mother, for their patience, guidance and support throughout my life journey.

Navid

TABLE OF CONTENTS

ACKNOWLEDGEMENTS

We would like to acknowledge with appreciation, all the backstage contributors for their kind contribution. First, we are extremely grateful to our patients, whom shared their life story with us.

Second, our special thanks go to all the personnel in different eye hospitals through the country for their support in preparation of imaging used in the book:

Rassoul Akram Hospital, Ophthalmology Department, Tehran, Iran

Markazi Eye Clinic, Tehran, Iran

Mehr Eye Hospital, Tabriz, Iran

Hakiman-Noor Eye Hospital, Tabriz, Iran

Nikookari Eye Hospital, Tabriz, Iran

Alavi Eye Hospital, Tabriz, Iran

Noor Eye Hospital, Tehran, Iran

Razi Eye Hospital, Tehran, Iran

At the end, we would like to thank all the team in Cambridge Scholars Publishing group, for their kind support through the publication process; especially Alison Duffy, Rebecca Gladders and Adam Rummens.

PREFACE

In the dynamic landscape of medical education, case-based learning has emerged as a cornerstone for effective comprehension and skill development. It is with great enthusiasm and dedication that we present this book, focused on the intriguing realm of glaucoma through the lens of case presentations and discussions.

Our goal is to offer a valuable resource for learners, practitioners, and enthusiasts alike. Each chapter of the book covers distinct aspects of glaucoma and each case presented within these chapters is carefully crafted to provide a blend of routine scenarios and challenging, controversial cases. Illustrated with images, these cases serve not only as educational tools but as gateways into the complex world of glaucoma diagnosis.

The integration of pictures and images is deliberate; a visual aid to enhance the learning experience. As you navigate through the cases, you'll encounter a tapestry of routine and extraordinary findings, each contributing to a deeper understanding of glaucoma's multifaceted nature.

At the conclusion of each case, we provide clinical tips and hints, distilling practical insights garnered from real-world experiences. This addition is designed to empower readers with actionable knowledge, bridging the gap between theory and application.

As you embark on this journey through the chapters, we hope this book becomes a valuable companion in your exploration of glaucoma. May it inspire curiosity, provoke thought, and ultimately contribute to your growth as a practitioner

We extend our gratitude to the contributing ophthalmology centers, whose generous sharing of images has enriched the content of this book

FOREWORD

Glaucoma represents a complex group of ophthalmic diseases and proper diagnosis and management can be at times challenging and mystifying given the potential for progression towards irreversible visual impairment. The book 'Illustrated Glaucoma Case Presentation: A Guide for Daily Practice' by Drs. Naveed Nilforushan and Navid Abolfathzadeh takes the reader on a journey through the nuanced landscape of glaucoma, providing a great educational tool for unraveling the complexities inherent in the diagnostic and therapeutic realms of glaucoma. The book is case-based, and the reader learns an important fact or two from every case. The chapters cover broad topics in the field of glaucoma from the fundamental aspects of open-angle and angle-closure glaucoma, through the advanced diagnostic insights offered by optical coherence tomography and critical evaluation of visual fields in glaucoma. The book further ventures into the realm of glaucoma mimickers and concludes with interesting discussions on complications of glaucoma surgery, offering a panoramic view of current practices and challenges in glaucoma management. Each chapter provides meticulously selected case studies to illustrate crucial concepts in glaucoma and proper clinical judgement. The chapter on 'Glaucoma Mimickers' serves as a crucial reminder of the differential diagnoses that clinicians managing glaucoma must consider before reaching a diagnosis of glaucoma; it emphasizes the importance of comprehensive assessment of every glaucoma patient and the potential for misdiagnosis. The book, through the lens of case studies and evidence-based practices, sheds light on the critical aspects of diagnosis, treatment strategies, and the ongoing quest for innovation in the field.

This book represents a serious endeavor to summarize current practices in glaucoma and will help a generation of eyecare professionals to excel in the care of glaucoma patients. I would like to commend the authors for a job very well done!

Kouros Nouri-Mahdavi, MD, MS
Los Angeles, California

PART A

CHAPTER 1

OPEN ANGLE GLAUCOMA (PRIMARY, SECONDARY)

Case 1

History

A 27-year-old man was referred to the glaucoma clinic for further evaluation. He has had a history of YAG Laser PI and was under treatment with Cosopt eyedrop twice a day due to multiple episodes of high IOP in both eyes for a year. He was also under treatment with Quetiapine and Phenytoin tablets for bipolar disorder.

Ocular examination

The BCVA (-1.00/-1.00×10 OD; -2.00/-0.25×180 OS) was 10/10 (OU). RAPD was negative, and EOM was normal in both eyes. Color vision evaluation showed 7/7 in both eyes. IOP with Cosopt was 12 and 17 mmHg before pupillary dilation in the right and the left eye, respectively. Anterior segment examination was normal except for triangular-shaped endothelial pigment deposition (Krukenberg spindle) in both eyes.

Posterior segment examination showed pink and sharp discs, with a C/D ratio of 0.5 in the right eye and 0.4 in the left eye. Examination of the peripapillary RNFL was within normal limits. In 4-mirror gonioscopy, the angle configuration according to the Spaeth classification was D40r with 4+ jet-black uniform trabecular meshwork pigmentation (Fig. 1-1, red arrow).

Clinical judgment

According to the anterior segment findings, the patient was considered as a case of "Pigment Dispersion Syndrome (PDS)". Since these patients are at risk for glaucoma in the future, baseline fundus photos (Fig. 1-2) and PPOCT were requested.

Paraclinical evaluations

PPOCT was of good quality, with normal findings in both eyes.

Assessment

The patient was a classic PDS case. However, none of the paraclinical examinations showed signs of glaucomatous optic neuropathy.

It should be noted that performing YAG Laser PI in pigment dispersion syndrome with high IOP is controversial but is sometimes suggested for those with a quere peripheral iris to alleviate the reverse pupillary block mechanism, which has been proposed as the primary mechanism for high or fluctuating IOP.

Management

The patient was recommended to continue his medication and scheduled for a follow-up exam 3-6 months later. The patient was also reassured that the systemic medications do not have a causative role in the present ocular disease.

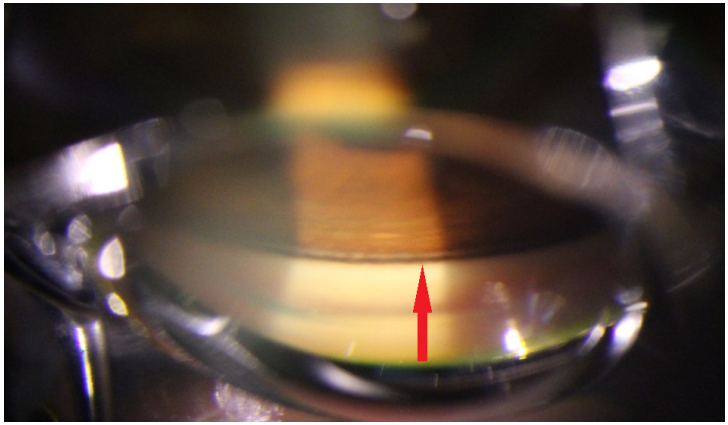


Figure 1-1. The dense and uniform pigmentation of the trabecular meshwork is shown in this gonioscopic view of the superior angle (red arrow).

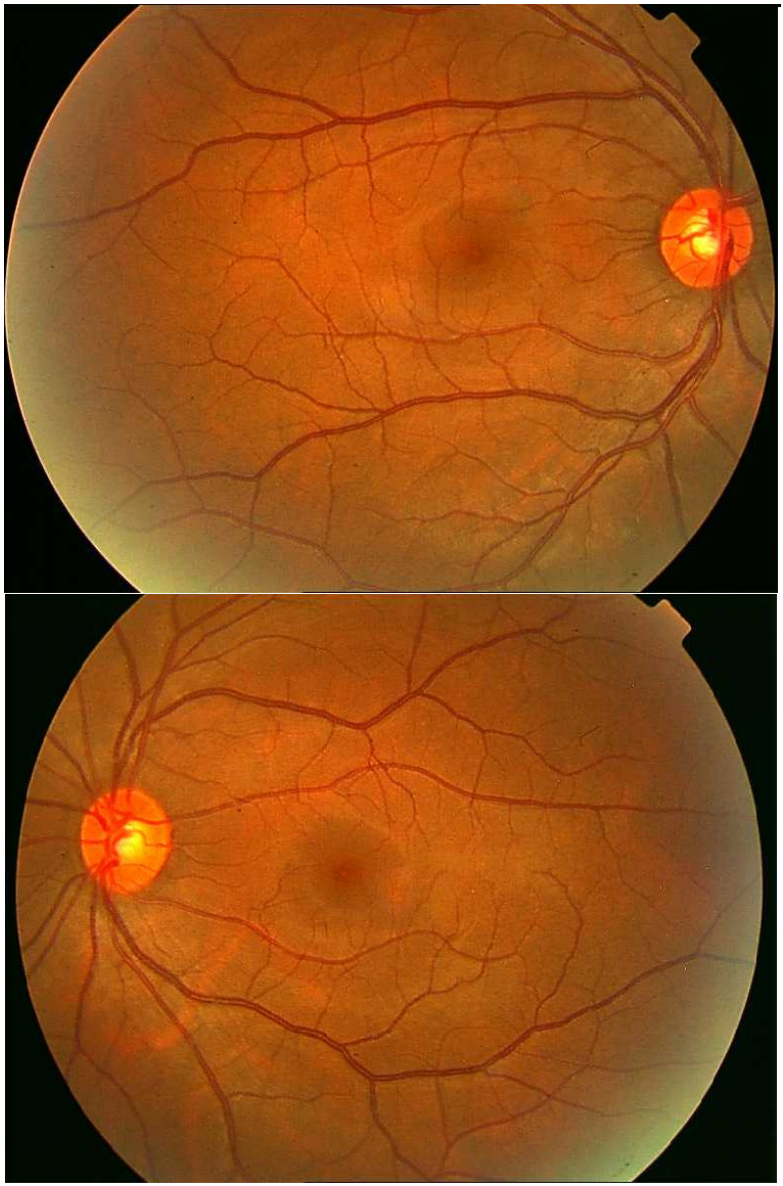


Figure 1-2. Fundus photos show healthy optic discs with good peripapillary nerve fibre layer reflection.

Case 2

History

A 33-year-old woman came to the glaucoma clinic because of the redness and pain in her left eye for a week. On her first visit, she presented to the general ophthalmology clinic and was diagnosed with anterior uveitis and prescribed betamethasone 0.1% (q2h), homatropine 2% (q6h), and timolol 0.5% (Timoptic) eyedrop (q12h). IOP at first presentation was about 30 mmHg.

Systemic evaluation was normal, and family history of glaucoma and drug history was negative. She mentioned that she has had at least four episodes of the same symptoms in the left eye in the last 6 years.

Ocular examination

Her UCVA was 10/10 and 3/10 in the right and left eye, respectively. Reverse RAPD was negative, and EOM was normal in both eyes. IOP was 12 mmHg and 9 mmHg in the right and the left eye, respectively. Anterior and posterior segment examinations were normal in the right eye.

However, in the left eye, the anterior segment exam showed large mutton-fat keratic precipitates (KPs) on the central and one-third inferior of the corneal endothelium with 2+ cellular reactions in the anterior chamber (Fig. 1-3). There was no epithelial defect or any stromal lesions. The pupil was mid-dilated and irregular; the lens was clear, and the gonioscopy showed an open angle with no PAS. Posterior segment examination was within normal limits (symmetrical C/D ratio of 0.2).

Clinical judgment

Herpes virus-associated uveitis was considered as a first diagnosis based on her history of previous attacks, unilaterality of the findings, high IOP, and picture of the KPs.

Management

All medications were continued at the same dosage; oral acyclovir 400 mg (q5h) and prednisolone 50 mg (qd) were added. At the follow-up visit after 10 days, KPs were mostly resolved, IOP was about 11 mmHg, and the anterior chamber was free of cells. Therefore, oral prednisolone and

homatropin eyedrops were tapered off and discontinued over about 5-6 days.

However, considering the history of recurrent attacks, a full dose of oral acyclovir was continued for 14 days, and after, the prophylaxis dosage of 400 mg every 12 hours was ordered.

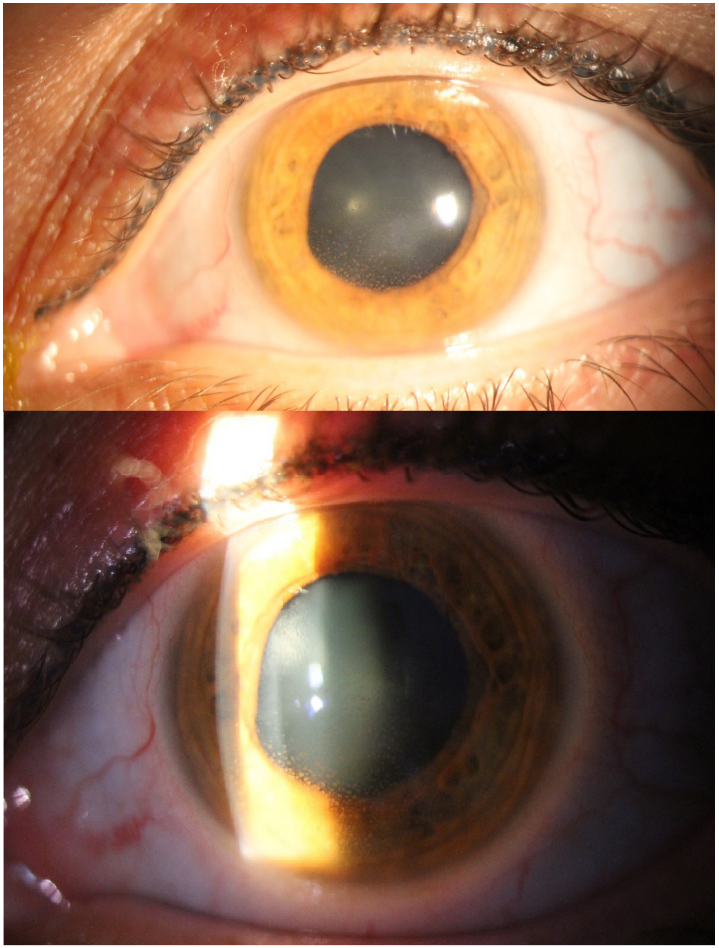


Figure 1-3. Slit lamp photos show fixed irregular mid-dilated pupil with multiple mutton-fat KPs on the central and one-third inferior of the corneal endothelium in the left eye.

Case 3

History

A 30-year-old woman was referred to the glaucoma clinic for evaluation of post-deep vitrectomy uncontrolled IOP. She was a known case of quiescent idiopathic intermediate uveitis in the left eye for 2 years, complicated by an extensive epiretinal membrane and full-thickness macular hole.

Pars plana vitrectomy with ILM peeling and SF6 gas injection was done in the left eye five weeks ago. After surgery, a high frequency of betamethasone eyedrops was initially prescribed and then tapered off to every 12 hours. IOPs were in the normal range in all preoperative and postoperative examinations up to a week before referral to our clinic which was 10 and 40 mmHg, in the right and the left eye respectively. The primary surgeon had started Cosopt and Alphagan (q12h) for the left eye before the referral.

Ocular examination

At the time of our examination, BCVA was 10/10 (-0.50-1.75×100) in the right eye and 4/10 (-2.25-0.50×40) in the left eye. IOP was 16 mmHg and 20 mmHg in the right and the left eye, respectively. Anterior segment examination was normal in both eyes. In the gonioscopy, the angle was open.

Posterior segment examination showed pink and sharp discs. The C/D ratio was about 0.3-0.4 and 0.5 in the right and the left eye, respectively. The examination of peripapillary RNFL showed no obvious signs of drop out.

Clinical judgment

According to her history, she was assumed as a classic case of “Steroid-induced Ocular Hypertension (OHT)”.

Although we had normal findings of fundus and anterior segment, a PPOCT, HVF central 24-2, and CCT test were requested for baseline evaluation.

Paraclinical evaluations

PPOCT had a borderline quality in the right eye (Q:19) and good quality in the left eye (Q:25), showing within normal limits RNFL thickness in both eyes (Fig. 1-4). The Spectralis OCT (Heidelberg Engineering, USA), with the Glaucoma Module Premium Edition (GMPE) mode, measures the neuroretinal rim (NRR) based on Bruch's membrane opening-minimum rim width (BMO-MRW) protocol. In this protocol, the minimum distance between the end point of Bruch's membrane and the ILM is measured and shown as small vertical arrows representing the MRW at each point (Fig. 1-5, small green arrows inside the yellow circle). Using this GMPE mode, we can find any early abnormalities in the peripapillary and papillary structures.

The HVF tests were reliable and showed an early central scotoma in the left eye (Fig. 1-6, green hollow arrow).

CCT was 508 and 512 μm in the right and the left eye, respectively.

Assessment

Although the PPOCT looked normal, the peripapillary tomogram showed retinal edema in the superior and inferior poles of the left optic nerve, which is expected after a recent retinal surgery (Fig. 1-4, blue arrow).

Sometimes, during acute phases of the IOP rising and in young patients, we may see structural changes earlier using disc topography rather than PPOCT. Therefore, in these cases, BMO-MRW can give more information about the effect of IOP on the optic disc (Fig. 1-5), while PPOCT can show structural changes only after the complete resolution of peripapillary retinal edema, which may take several weeks to happen.

Management

As a first step, betamethasone was discontinued, and the patient was followed up with Cosopt/Alphagan (q12h) in the left eye (IOPs in the range of 15-20 mmHg without any clinical progression to glaucoma).

Next, stepwise discontinuation of antiglaucoma medications was considered (first by Alphagan). Three weeks after discontinuing Alphagan, IOP was 12-14 mmHg in the left eye in two consecutive visits. Therefore, Cosopt was also discontinued, and a follow-up visit was scheduled for a month later. Six months after discontinuing Cosopt, the IOP of the left eye was 12-13 mmHg in multiple visits.

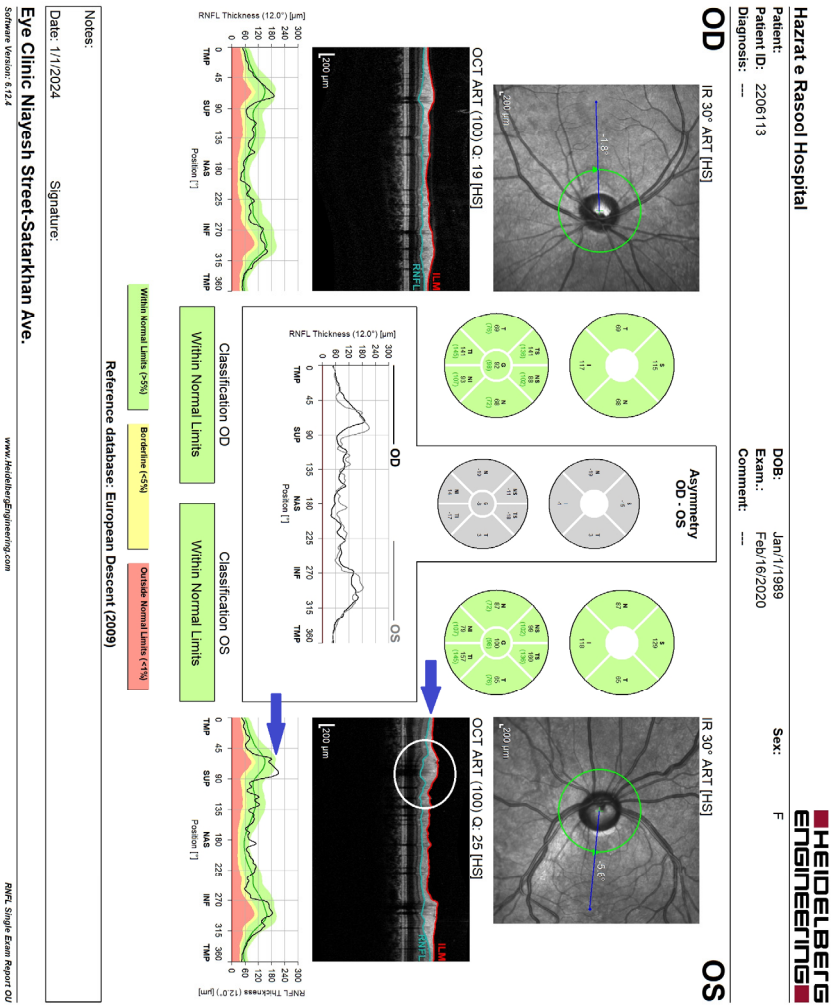


Figure 1-4. PPOCT had a borderline quality in the right eye (Q:19) and good quality in the left eye (Q:25). The peripapillary tomogram shows retinal edema in the superior and inferior poles of the left optic nerve (blue arrows, white circles).

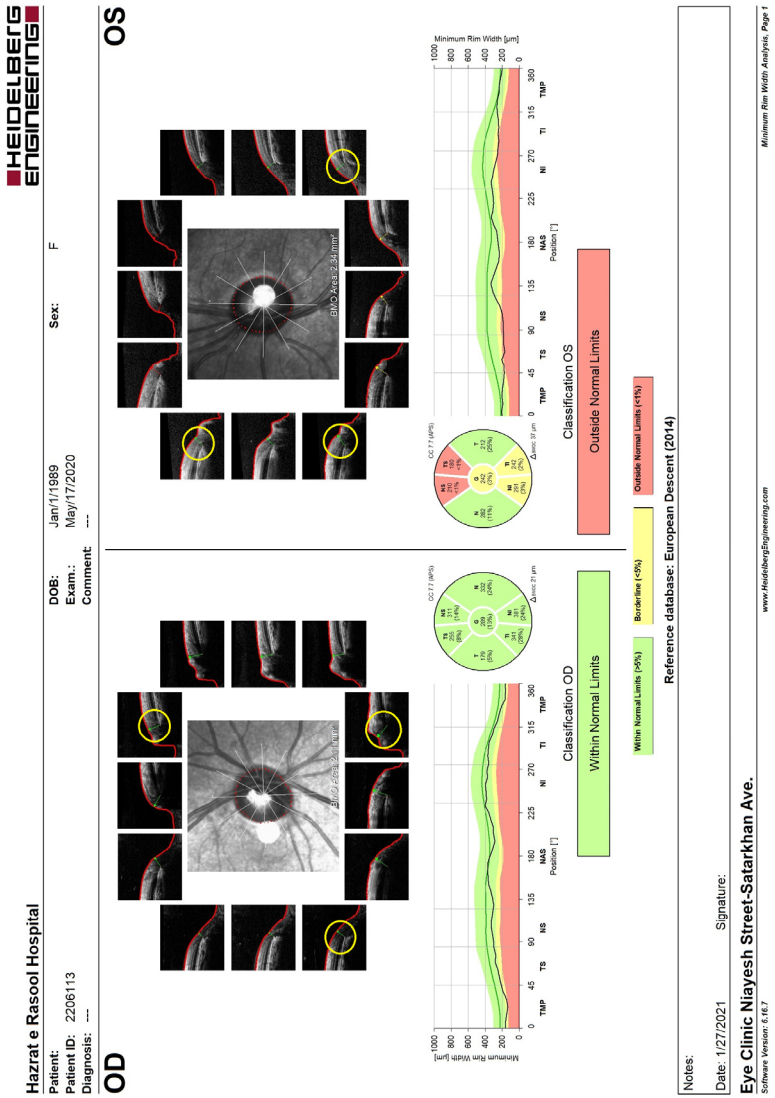
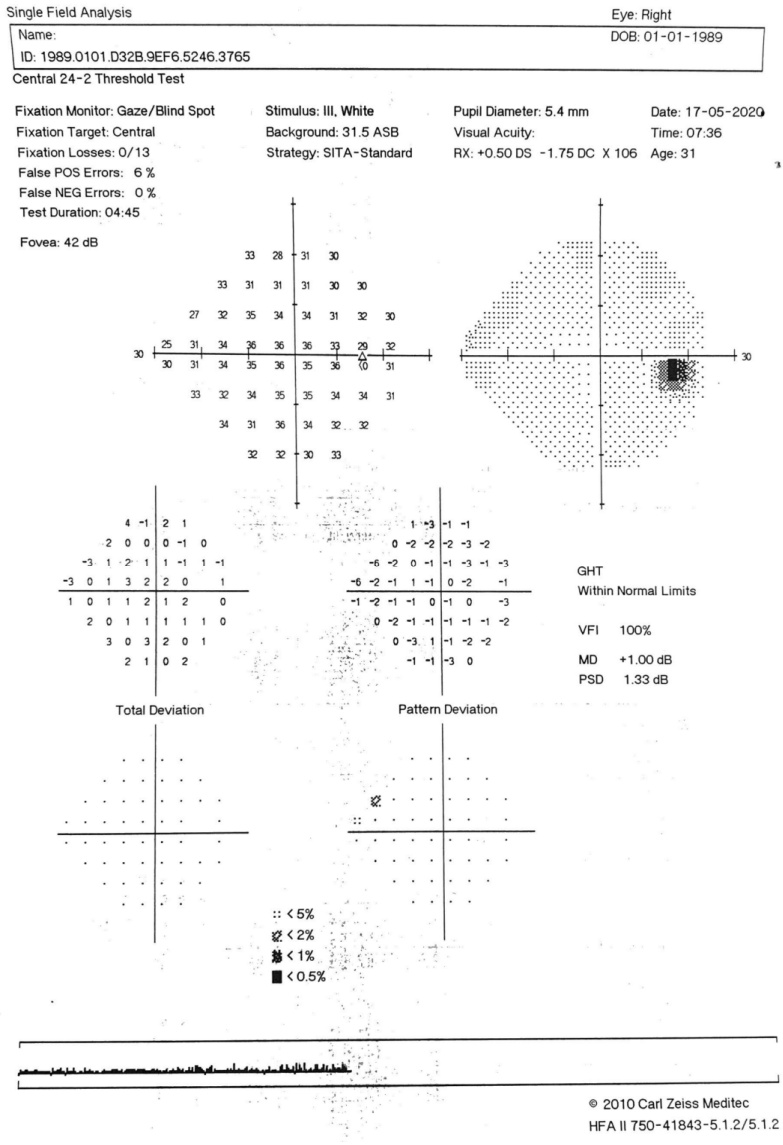


Figure 1-5 BMO-MRW printout of optic disc OCT. Yellow circles show the site for measurement of minimum rim width (MRW) at the endpoint of the Bruch's membrane.


Single Field Analysis
Eye: Right
Name:
DOB: 01-01-1989
ID: 1989.0101.D32B.9EF6.5246.3765
Central 24-2 Threshold Test
Fixation Monitor: Gaze/Blind Spot
Fixation Target: Central
Fixation Losses: 0/13
False POS Errors: 6 %
False NEG Errors: 0 %
Test Duration: 04:45
Fovea: 42 dB
Stimulus: III, White
Background: 31.5 ASB
Strategy: SITA-Standard
Pupil Diameter: 5.4 mm
Visual Acuity:
RX: +0.50 DS -1.75 DC X 106
Date: 17-05-2020
Time: 07:36
Age: 31
GHT
Within Normal Limits
VFI 100%
MD +1.00 dB
PSD 1.33 dB
Total Deviation
Pattern Deviation
:: < 5%
< 2%
< 1%
< 0.5%
© 2010 Carl Zeiss Meditec
HFA II 750-41843-5.1.2/5.1.2

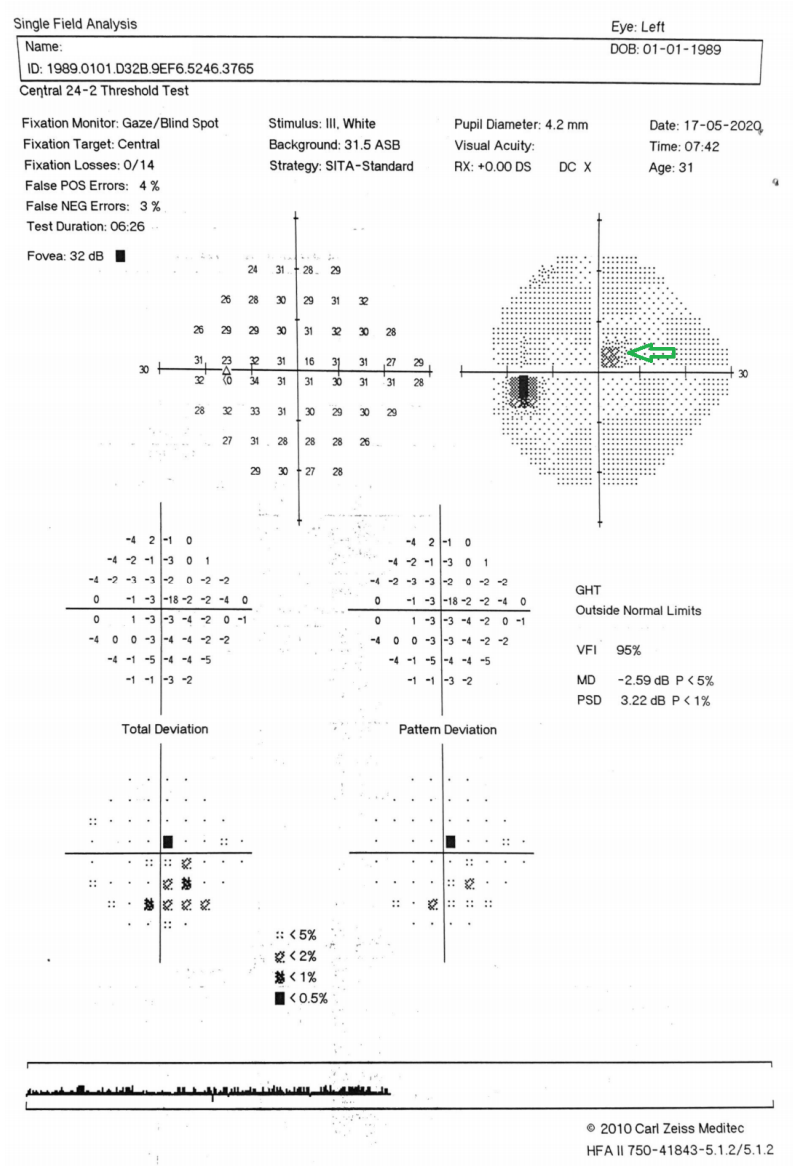


Figure 1-6. HVF test shows a normal field in the right eye and an early central scotoma in the left eye (green hollow arrow).

Case 4

History

A 79-year-old woman presented for more evaluation at the glaucoma clinic. She has been under treatment with Alphagan OU for 6 months. However, she discontinued the medication 2 months ago.

She was a healthy woman, and systemic evaluation was only positive for essential hypertension.

Ocular examination

BCVA was 3/10 (+1.25-2.50×100) in the right eye and 2/10 (+0.75-3.25×70) in the left eye. RAPD was negative, and EOM was normal in both eyes. IOP was 27 and 29 mmHg after pupillary dilation in the right and the left eye, respectively, at 4:30 pm. Anterior segment examinations showed 2+ nuclear sclerosis and cortical cataracts in both eyes. In the gonioscopy, the angle was open with no abnormal findings.

In the posterior segment examination of the right eye, the optic nerve head had a 0.6 C/D ratio and peripapillary atrophy. In the left eye, the disc had near total cup and peripapillary atrophy.

Clinical judgment

Since the clinical exam favored POAG, we decided to do PPOCT and HVF tests.

Paraclinical evaluations

The quality was good in the PPOCT (Q:23 OD, Q:24 OS); there were borderline and outside normal limits sectors in both eyes. If you look carefully, you can see that the circles around the discs are well-centered in both eyes; however, the dense peripapillary atrophy has affected the accuracy of measured RNFL thickness in some areas (Fig. 1-7).

The visual field was compatible with mild glaucomatous damage in the right eye and severe glaucomatous damage in the left eye (Fig. 1-8). Diurnal IOP, as shown in the below table, is mostly above 20 mmHg and consistently higher in the left eye.

CCT was 574 and 541 μm in the right and the left cornea, respectively.

Time / IOP (mmHg)	OD	OS
8:00	22	23
12:00 MD	21	23
16:00	24	26
20:00	18	20
23:00	22	27

Assessment

According to diurnal IOP measurements at different times and the abnormal findings from the HVF, the initial diagnosis of POAG was confirmed for the case and was more advanced in the left eye. The target IOP was set in the low teens for the left and mid-teens for the right eye.

Management

The patient was prescribed Xalacom (qd) for both eyes, and the follow-up visit was scheduled for 1 month later.

Follow-up

At the follow-up visit, we found a large splinter hemorrhage on the disc of the right eye. The IOP measurements with Xalacom are shown here.

Time/IOP (mmHg)	OD	OS
13:00	21	20
17:00	19	21

Based on the measured IOP and splinter hemorrhage in the right eye, which both are signs of uncontrolled disease and possible progression in the future, we changed the medication to Xalatan (qhs) and Cosopt (q12h).

We scheduled the next visit for an IOP check and repeat visual field about 2 weeks later. The patient was also informed about possible glaucoma surgery if the target IOP was not achieved.

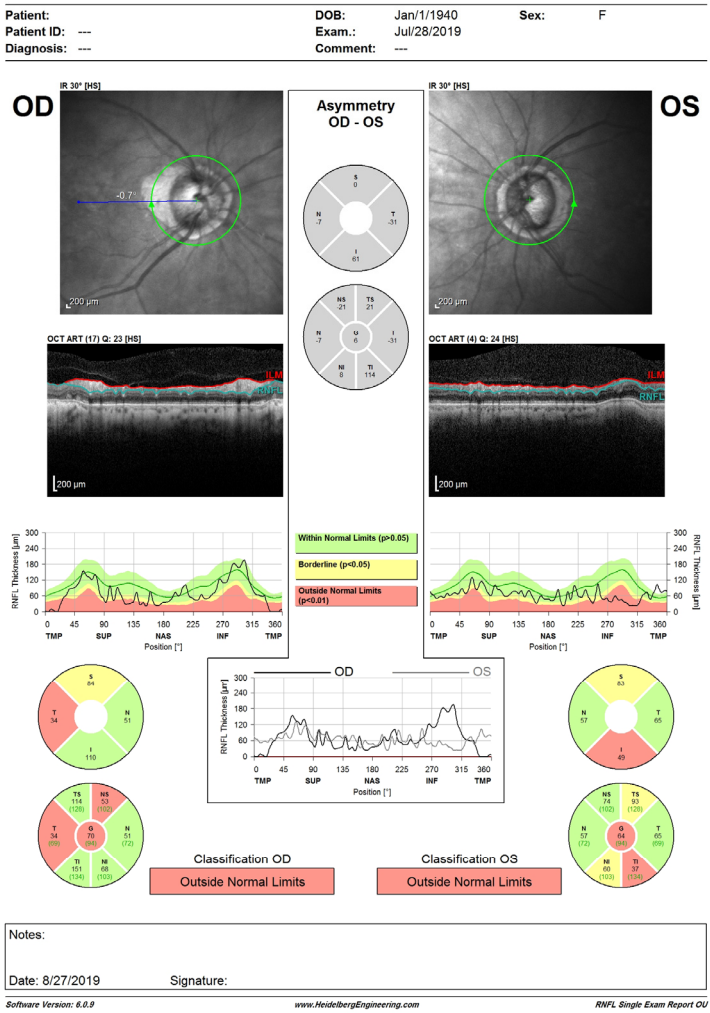
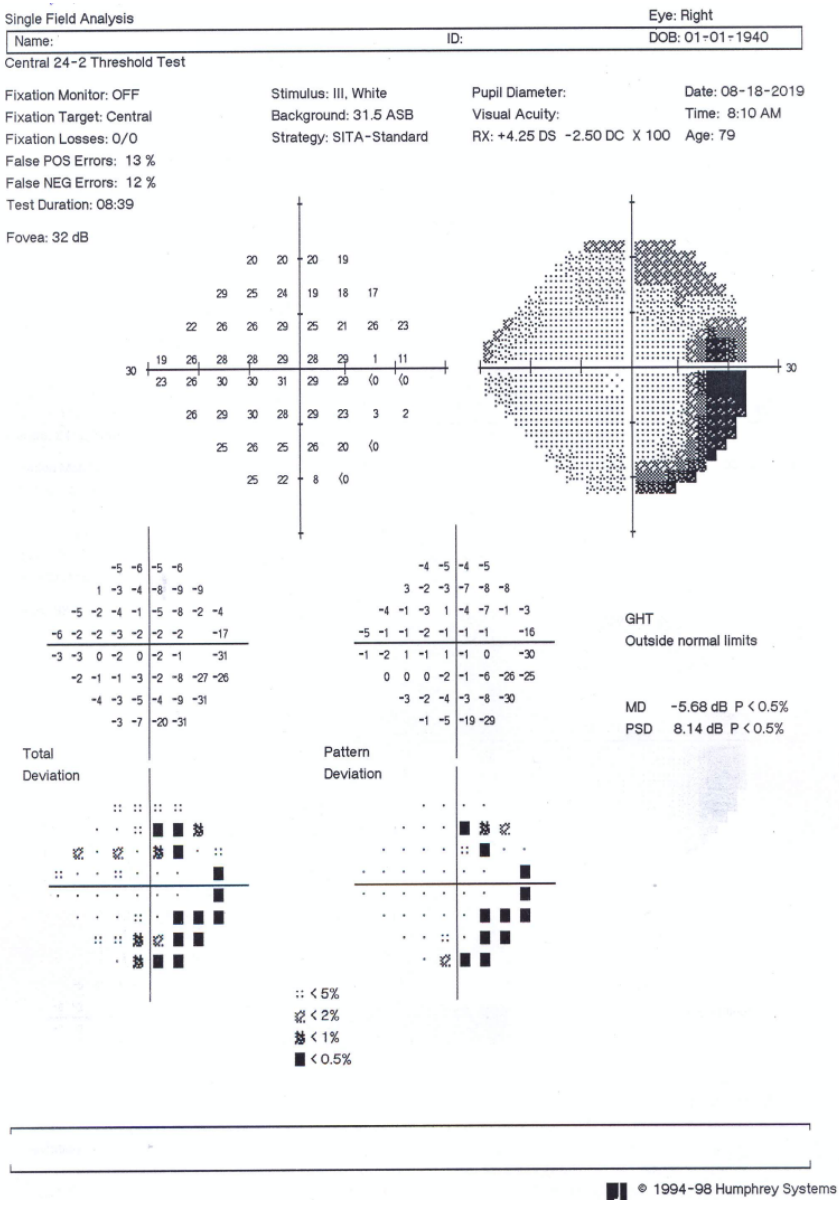


Figure 1-7. PPOCT shows dense peripapillary atrophy in both eyes, which could affect the measurement of RNFL thickness in some quadrants, especially in temporal and inferior sectors.


Single Field Analysis
Eye: Right
Name:
ID:
DOB: 01-01-1940
Central 24-2 Threshold Test
Fixation Monitor: OFF
Fixation Target: Central
Fixation Losses: 0/0
False POS Errors: 13 %
False NEG Errors: 12 %
Test Duration: 08:39
Fovea: 32 dB
Stimulus: III, White
Background: 31.5 ASB
Strategy: SITA-Standard
Pupil Diameter:
Visual Acuity:
RX: +4.25 DS -2.50 DC X 100
Date: 08-18-2019
Time: 8:10 AM
Age: 79
GHT
Outside normal limits
MD -5.68 dB P < 0.5%
PSD 8.14 dB P < 0.5%
Total Deviation
Pattern Deviation
:: < 5%
< 2%
< 1%
< 0.5%
© 1994-98 Humphrey Systems

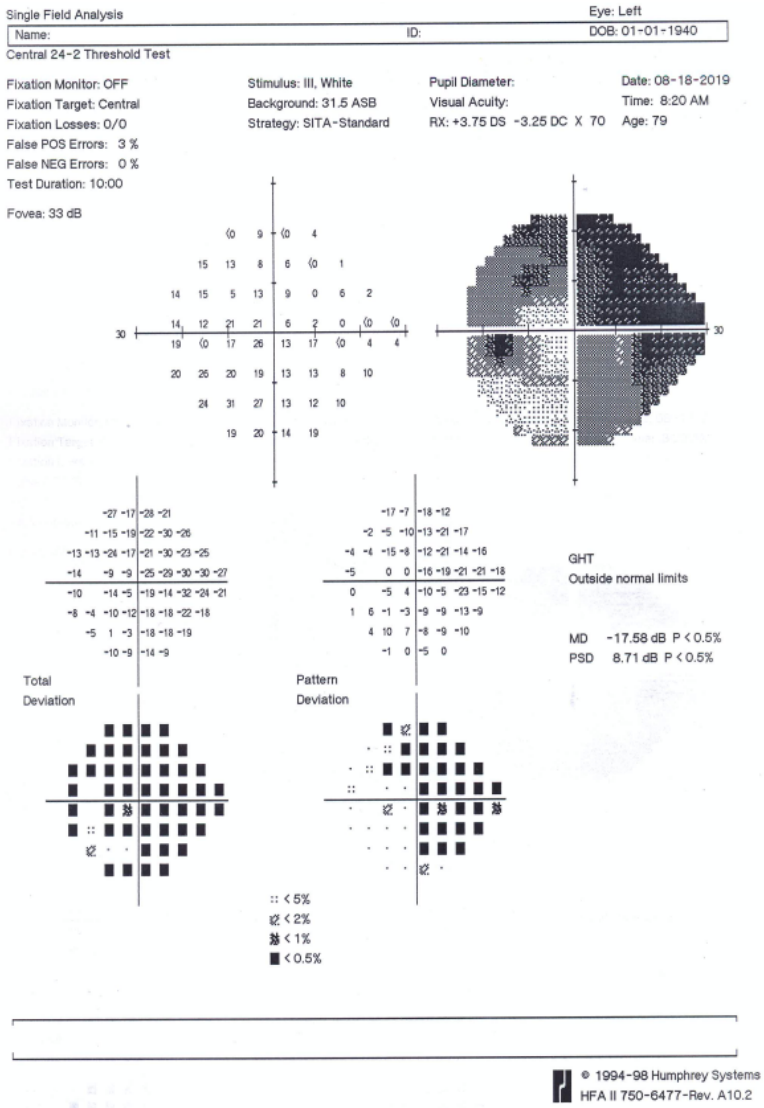


Figure 1-8. The reliability of the HVF in the right eye is fairly good (FN 12% and FP 13%) and is compatible with mild to moderate damage (MD -5.68). The reliability in the left eye is good with severe damage (MD -17.58).

Case 5

History

A 53-year-old man was referred from the oculoplastic clinic due to medically uncontrolled IOPs. He had a history of Thyroid eye disease (TED) with proptosis in both eyes for 6 months and orbital decompression surgery in the left eye a month before referral.

In different follow-up visits in the oculoplastic clinic, the IOPs have been in the range of 20-24 mmHg; therefore, Timoptic and Alphagan (q12h) drops were prescribed for both eyes.

Ocular examination

BCVA was 8/10 (+1.25-1.50×50) in the right eye and 9/10 (+1.25-0.50×50) in the left eye. RAPD was negative, and EOM was normal in both eyes.

The anterior segment showed normal findings except for confluent corneal punctuate epithelial erosions in both eyes. IOP was 18 and 16 mmHg in the right and the left eye with Timoptic and Alphagan (q12h) drops, respectively. In the gonioscopy, the angle was open.

In the posterior segment examination, the optic nerve head was pink and sharp, and the C/D in the right eye was 0.2 and 0.1 in the left eye, with normal appearing RNFL.

Clinical judgment

This is a typical case of TED-associated OHT. As mentioned in the history, there were no signs of glaucomatous optic neuropathy in the clinical examination.

However, as a high-risk patient for optic nerve damage in the future, we need to have baseline structural and functional tests.

Paraclinical evaluations

According to the relatively young age of the patient and the initial stages of the TED, we decided to do PPOCT to find any early changes in the ONH and RNFL structures.

The PPOCT had good quality and showed normal findings in RNFL (Fig. 1-9) and BMO-MRW (Fig. 1-10) evaluations.

The Spectralis OCT with the GMPE measures the NRR based on the protocol of BMO-MRW. In this protocol, the minimum distance between the end point of Bruch's membrane and the ILM is measured and shown as small vertical arrows representing the MRW at each point (Fig. 1-10, small green arrow in the yellow circle).

However, if you look carefully, you will find that the BMO area is larger in the left eye (2.53 mm^2) than in the right eye (1.81 mm^2) (Fig. 1-10, blue boxes), and the global and sectoral BMO-MRW thickness measurements are in 99 percentiles of the corresponding normal age-matched population. When comparing both eyes, we appreciate that these findings are due to segmentation errors and wrong localization of the BMO site, which is illustrated in the magnified version in figure 1-11 (red dotted line around the disc).

In this patient, CCT was 605 and 560 μm in the right and the left eye, respectively. The HVF examination was unremarkable in both eyes.

Assessment

According to the clinical examination and OCT findings, we do not see any signs of glaucomatous optic neuropathy but are facing a case with possible OHT.

Here, we need to pay attention to the fact that TED is associated with dry eye in its natural course, and this condition could become aggravated by additional effects from the preservatives in anti-glaucoma medications. Therefore, such patients should be managed with as few medications as possible or preservative-free drops if available.

Management

With the relatively thick cornea in this case, it was decided to continue observation with the discontinuation of medical therapy and recheck the IOP in the next month. In conjunction, a lubricant was prescribed for the patient. The plan was to start the least amount of medication (a preservative-free one, if possible) if the IOP was still over 24 mmHg, with the target of a 20% decrease in IOP. We should note that IOP measurement in a proptotic patient with extraocular muscle involvement is somewhat challenging and misleading. Any change in eye direction can significantly change the IOP.

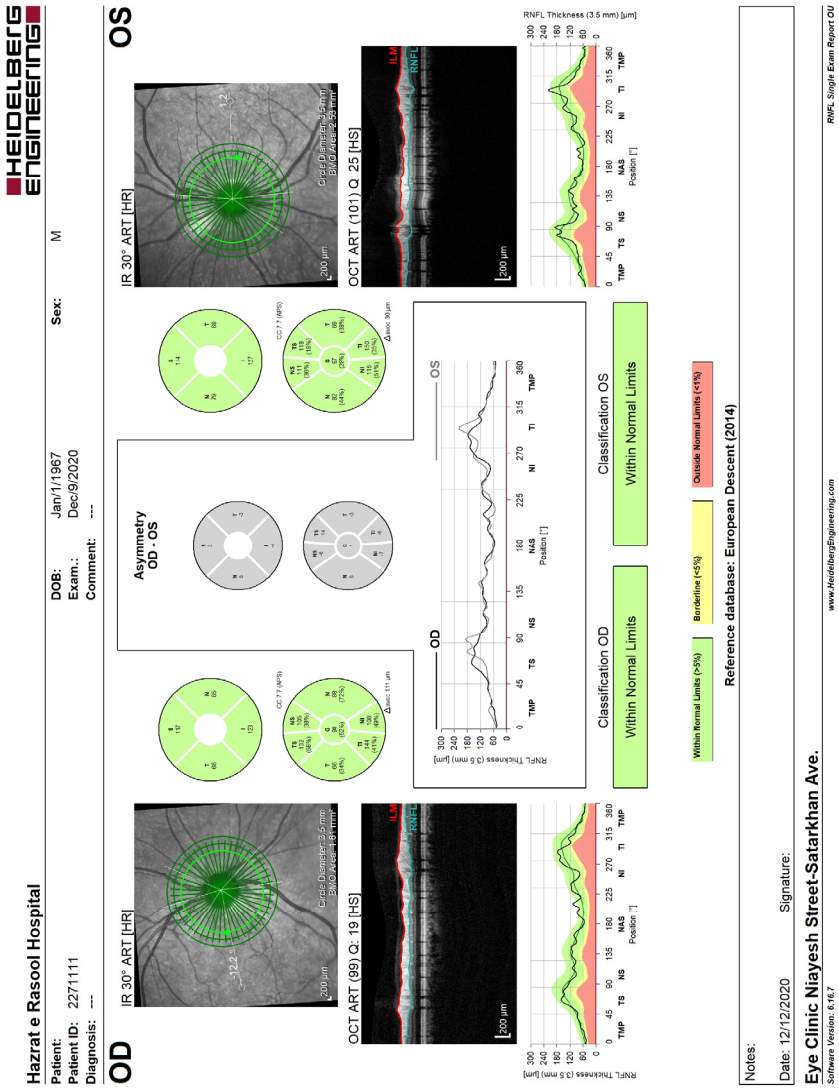


Figure 1-9. PPOCT shows normal RNFL thickness in both eyes.