The Role of OCT in Optometric Practice in Nigeria

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Abstract

Optical Coherence Tomography (OCT) can be used to detect ocular changes many of which may not be detectable using conventional viewing methods [1]. But despite its usefulness in detecting ocular pathologies, tracking pathology progression, response to treatment of the said pathologies, and making prompt and educated referrals, when necessary, its use in the optometric field in Nigeria has been limited.

This paper attempts to emphasise the importance of OCT in clinical practice using clinical case reports and provide recommendations for addressing the factors influencing its limited use by optometrists in Nigeria.

Keywords: Optical Coherence Tomography (OCT) • Automated Visual Field (AVF) • Retina

Introduction

The use of Optical Coherence Tomography (OCT) in the eye care field world over has exploded since its introduction over 20 years ago and its usefulness in patient management cannot be overemphasized [1]. The OCT can be used to detect early glaucomatous changes in the RNFL and GCL of the retina which might not be detected using conventional visual field analysers [2]. It can also be used in detecting maculopathies, retinopathies, optic nerve head damage due to tumours in the higher centres, etc. many of which may not be detectable using conventional retinal viewing methods (e.g., ophthalmoscopy, 90D, BIO, and fundus photography) [3]. Also, the anterior segment attachment of the OCT provides deeper insight into anterior eye segment structures to assess the anterior chamber and cornea topography, diagnose cornea pathologies, etc. [4]. But despite its usefulness, its use in the optometric field in Nigeria has been limited. Its limited use has been accredited to various factors such as cost of the equipment, cost of the procedure, the unfamiliarity of the equipment to optometrists, inability to interpret test results, etc. This study tries to highlight the importance of OCT in the practice of optometry and how it can sometimes serve as a lifesaving tool using clinical case reports. It also attempts to address the reasons behind its limited use in Nigeria and how they can be overcome for the benefit of both the patient and the practice of optometry in Nigeria and beyond.

CASE 1 Tracking response to treatment

A 54-year-old male with type 2 diabetes on medications for 10 years presented with pain and poor vision LE and seeing shadows BE for 3 months. He had no history of trauma or eye surgery. He was not on any medications for his eyes and his present glasses were gotten 5 months ago. His current fasting blood sugar (FBS) was 136 mg/dL though it had gotten as high as 400 mg/dL 6 months ago.

Ocular examination

VA (visual acuity) unaided: RE (Right Eye) 6/12 LE (Left Eye) 6/24 VA aided RE 6/12 LE 6/36.

Anterior segment: no abnormality detected BE (Both Eyes)

Lens: 1+ Nuclear Sclerosis BE

Fundus: C/D (Cup to Disc) ratio 0.3 BE, macular oedema LE

IOP (Intraocular Pressure): RE 12 mmHg LE 10 mmHg

Further ocular exams

CCT (Central Cornea Thickness): RE 551 μm (-0.4) LE 567 μm (-1.5)

AVF (Automated Visual Field): Unremarkable with generalized reduced sensitivity consistent with nuclear sclerosis BE.

Fundus photo: Blot haemorrhage, hard exudate, microaneurysm, refractile bodies BE

OCT (Optical Coherence Tomography): Clinically significant macular oedema BE, blot haemorrhage, hard exudate, microaneurysm BE.

Diagnosis: Diabetic retinopathy with clinically significant macular oedema BE.

Management: 3 doses per eye of Intravitreal avastin injection at monthly intervals (Figure 1).

Follow up visits

1-month post 1st Avastin dose

FBS: 148 mg/dl

VA unaided: RE 6/12 LE 6/18

IOP: RE 12 mmHg LE 14 mmHg (Figure 2).

1-month post 2nd Avastin dose

FBS: 83mg/dl

VA unaided: RE 6/9 LE 6/24 (Figure 3).

1-month post 3rd Avastin dose

VA unaided: RE 6/12 LE 6/24

VA aided: RE 6/9 LE 6/18

IOP: RE 14 mmHg LE 14 mmHg (Figure 4).

Importance of OCT in this case

- It helped with diagnosis as the retina area could not be fully viewed by conventional means due to the presence of nuclear sclerosis.
- It was used to monitor the response to the anti-VEGF (Anti-Vascular Endothelial Growth Factor) therapy.

CASE 2 Detecting early glaucoma changes

A 56-year-old male with a family history of glaucoma presented with difficulty reading with present glasses and cloudy vision for 1 year. He also had complaints of occasional headaches and mild photophobia BE. There was no history of trauma or eye surgery.

Ocular examination

VA unaided RE: 6/12 LE 6/12 N8

VA aided RE: 6/5 LE 6/6 N5.

Anterior segment: no abnormality detected BE

Lens: 1+ Nuclear sclerosis BE

Fundus: RE pale cupped disc C/D ratio 0.7 LE pale cupped C/D ratio 0.8

IOP: RE 19 mmHg LE 17mmHg

Further ocular exams

Patient opted to only carry out the AVF test

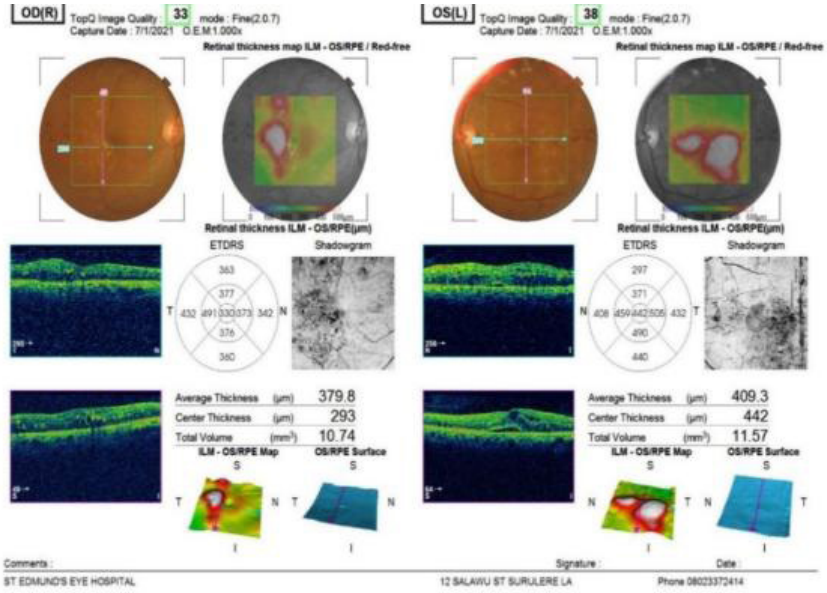

Figure 1. Initial visit OCT macular scan BE

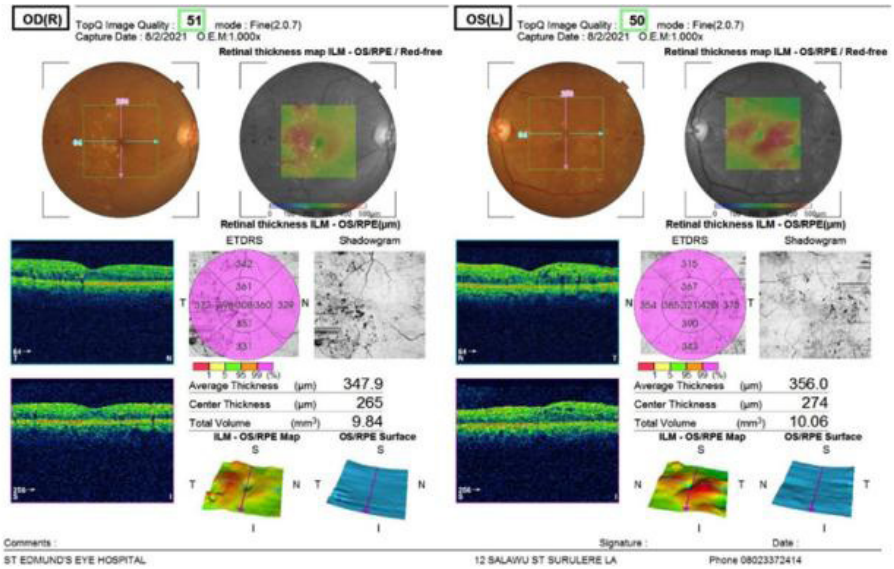

Figure 2. 1-month post 1st Avastin dose OCT macular scan BE

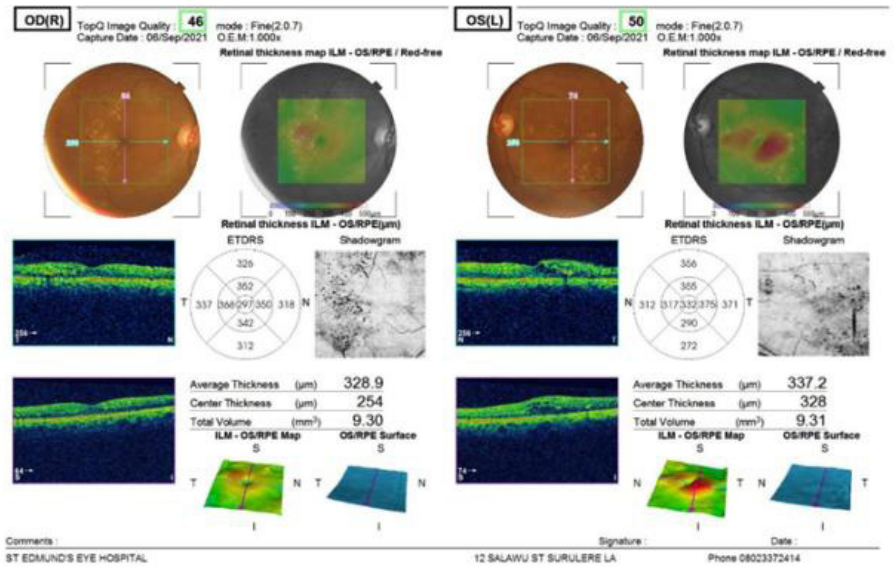

Figure 3. 1-month post 2nd Avastin dose OCT macular scan BE

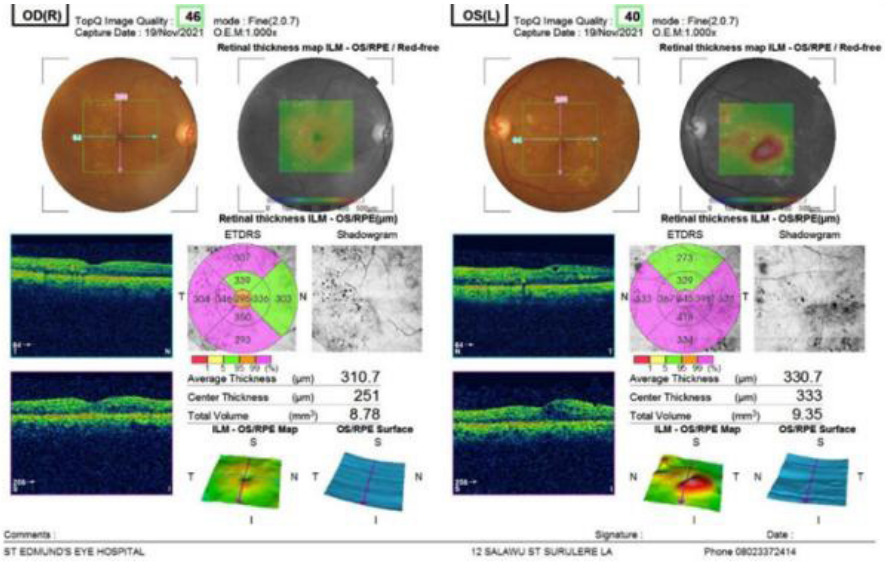

Figure 4. 1-month post 3rd Avastin dose OCT macular scan BE

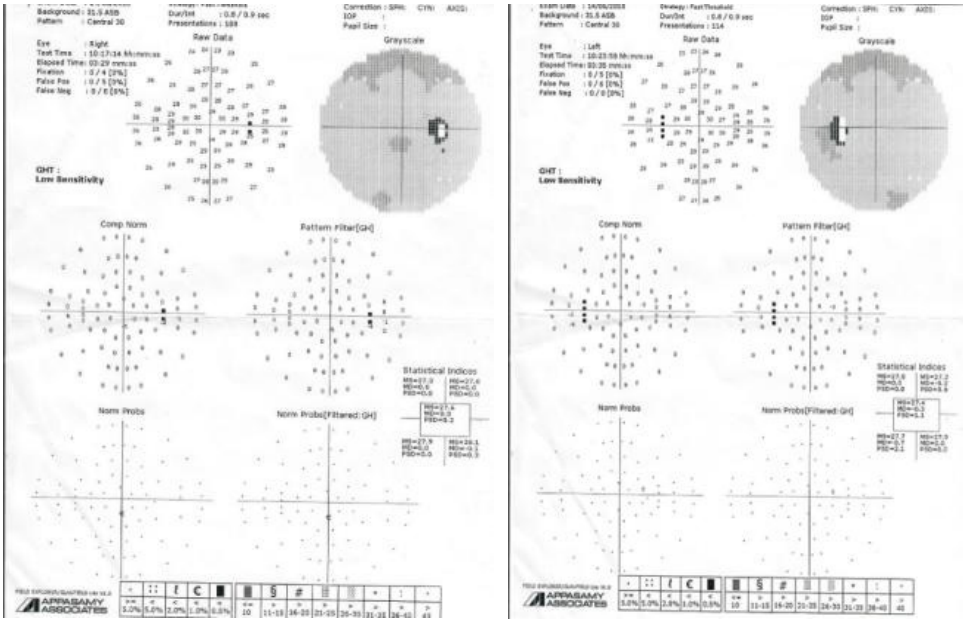

Figure 5. AVF result BE from initial visit

AVF: RE mild blind spot enlargement LE mild blind spot enlargement

Diagnosis: Glaucoma suspect

Management: Recommended carrying out all pending tests ASAP (Figure 5).

Follow up visit

He later presented 4 years after the first visit with complaints of cloudy vision for 2 years.

Ocular examination

VA unaided: RE 6/18 LE 6/12 **VA aided** RE 6/12 LE 6/18.

Anterior segment: no abnormality detected BE

Pupils: RE Normal LE subtle RAPD (Relative Afferent Pupillary Defect) detected

Lens: 1+ Nuclear Sclerosis BE

Fundus: RE poor details LE mild pallor C/D ratio 0.6

IOP: RE 23 mmHg LE 25 mmHg.

Further ocular exams

CCT: RE 522 μm (+1.6) LE 525 μm (+1.4)

Fundus photo: cupped discs BE

AVF: RE moderate superior and inferior arcuate scotoma LE extensive superior and inferior arcuate scotoma viz a viz tunnel vision.

OCT: RE mild thinning on GCL (Ganglion Cell Layer) normal RNFL (Retina Nerve Fibre Layer) LE significant thinning in GCL and RNFL especially inferiorly.

Diagnosis: Moderate glaucoma

Management: gutt latanoprost nocte BE, gutt azopt 12 hly (Figure 6-8)

Importance of OCT in this case

- It could have helped with early glaucoma diagnosis before functional changes in the nerve fibre occurred.
- It facilitated diagnosis when other testing methods proved inconclusive.

CASE 3 Diagnosis of neurological conditions

A 57-year-old female presented with eye aches and headaches (frontal). There was no history of trauma or eye surgery.

Ocular examination

VA unaided: RE 6/18 LE 6/9

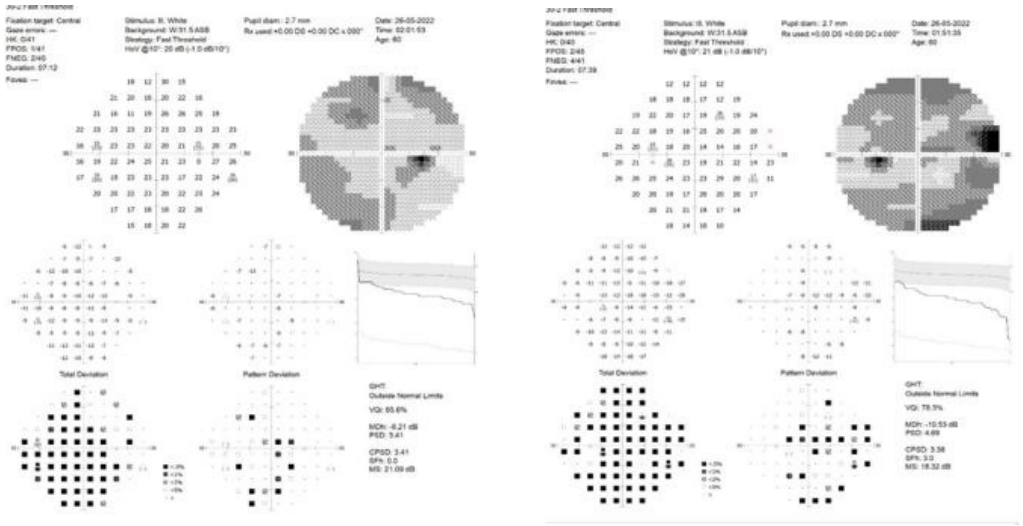

Figure 6. AVF result BE from 2nd visit.

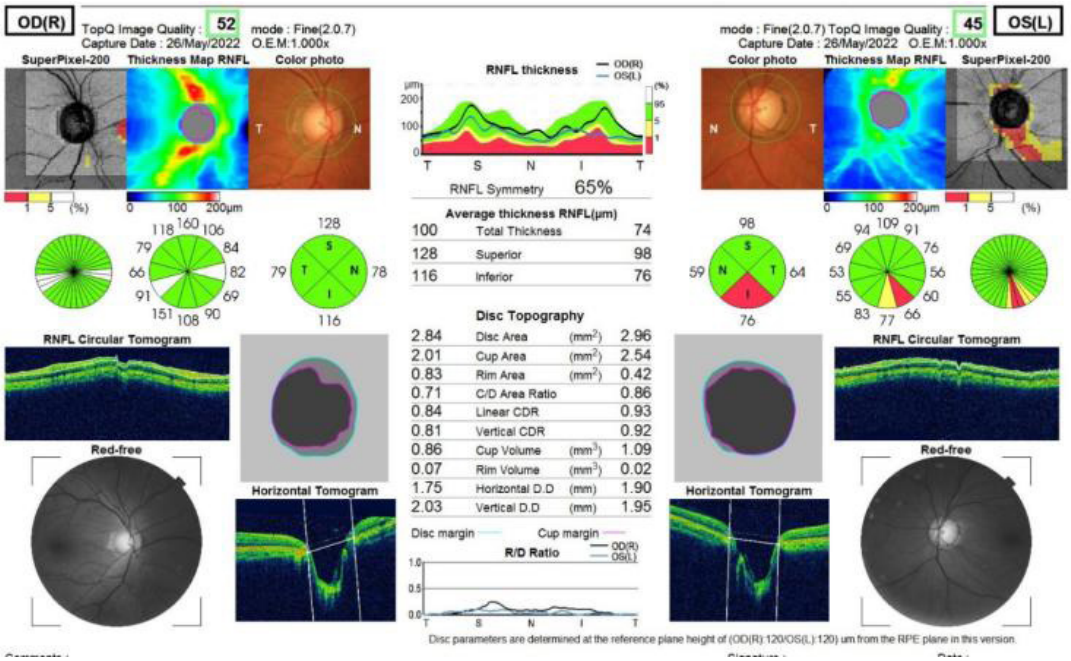

Figure 7. OCT RNFL scan BE from 2nd visit

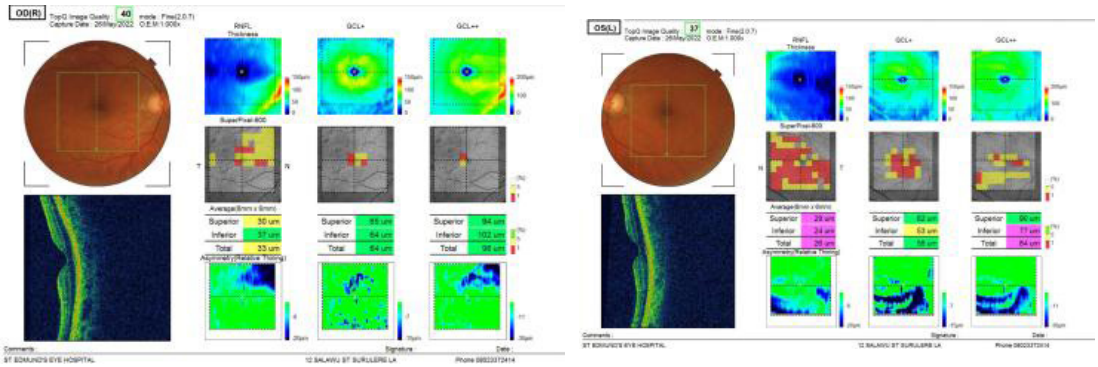

Figure 8. OCT RNFL and GCL scan BE from 2nd visit

VA aided: RE 6/12 LE 6/9

Anterior segment: no abnormality detected BE

Lens: 1+ Nuclear Sclerosis BE 1+PSC (Posterior subcapsular) LE

Fundus: C/D ratio 0.35 BE, refractile bodies RE

IOP: RE 15 mmHg LE 16 mmHg

Further ocular exams

AVF: was not done as the patient was uncooperative during the process and was not keen on carrying out the test

CCT: RE 548 µm (-0.2) LE 557 µm (-0.9)

Fundus photo: normal macular BE

OCT: RE mild RNFL thinning C/D 0.68 LE normal RNFL C/D 0.57

Diagnosis: Early glaucoma

Management: Gutt dozolamide bd BE (Figure 9).

1st follow-up visit

She presented a year after the first visit with complaints of blurry vision, and persistent left-sided headaches.

Ocular examination

VA unaided: R 6/9 L 6/18 **VA aided** R 6/9 L 6/12

IOP: RE 18 mmHg LE 16 mmHg

Lens: 1+ Nuclear Sclerosis BE 1+PSC LE Dull Macular Reflex LE

Fundus: C/D ratio 0.35 BE

Further ocular exams

AVF: not done on patient's request

OCT: severe RNFL thinning in all quadrants BE

Diagnosis: Normal-Tension Glaucoma

Management: to do MRI, continue all medications, AVF to be done

2nd follow-up visit

The patient came with the MRI results 2 weeks after the last visit. Results were indicative of a pituitary macroadenoma. She was referred to a neurosurgeon (Figure 10).

Importance of OCT in this case

Early detection of a brain lesion in a patient uncooperative for AVF.

CASE 4 Identifying false glaucoma diagnosis

A 7-year-old male with a family history of glaucoma presented with a history of blurred distant vision for 1 year. He was experiencing pain, mild photophobia, occasional redness, and mild foreign body sensation BE. There was no history of trauma or surgery and he had never used glasses nor he was on medication.

Ocular examination

VA Unaided: RE 6/9 LE 6/9

Anterior segment: no abnormality detected BE

Fundus: RE 0.5 LE 0.4 large cup large disc BE

Subjective refraction: R -1.00 6/5 L -0.25 6/5

Cycloplegic refraction: R +0.75 L +0.75

Post cycloplegic refraction: R +0.50 6/5 L +0.50 6/5

Diagnosis: Hyperopia

Management: To get glasses

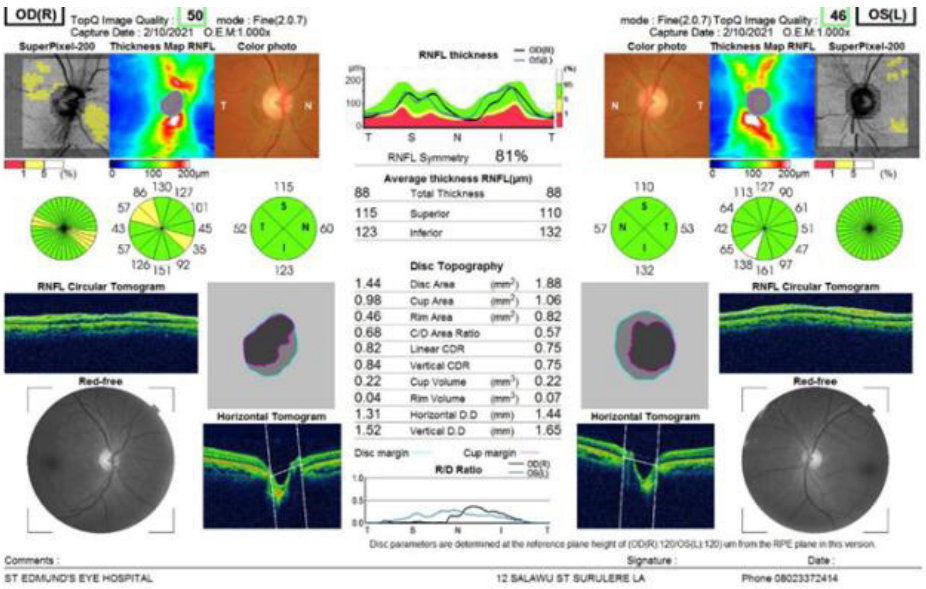

Figure 9. OCT RNFL scan BE from initial visit

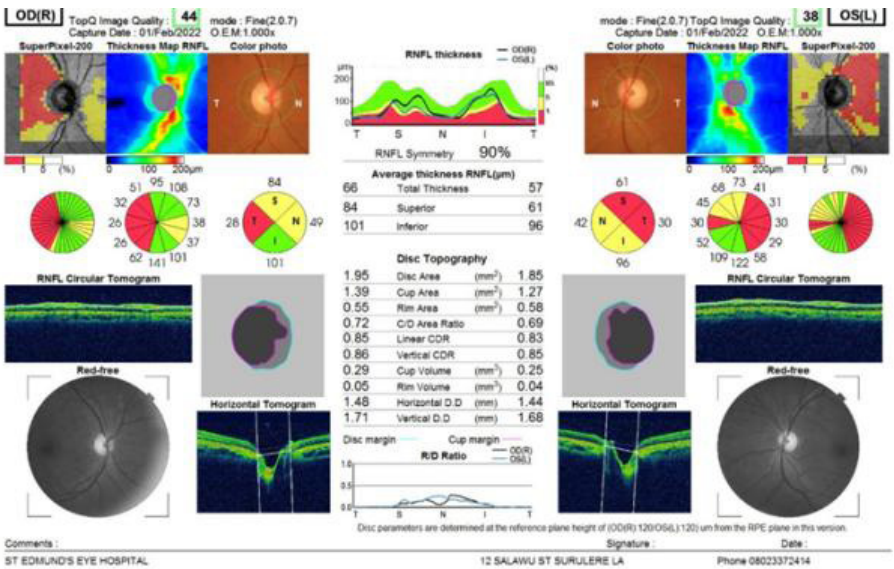

Figure 10. OCT RNFL scan BE from a 1st follow-up visit

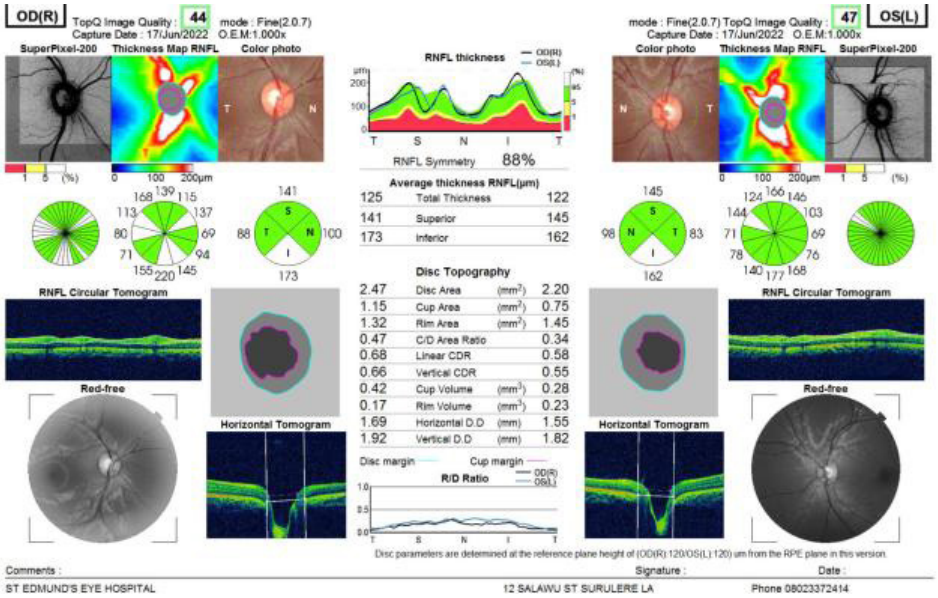

Figure 11. OCT RNFL scan BE from a follow-up visit

Follow up visit

The mother of the patient said she took the patient to another Eye center and was told he had glaucoma. She wanted a second opinion on their report. The medical report from the other center indicated IOP was RE 11 mmHg LE 10 mmHg. The patient was uncooperative for AVF and was eventually placed on gutt timoptol bd BE by the other eye center.

Ocular examination

Unaided: VA RE 6/18 LE 6/12

Aided VA: RE 6/9 LE 6/5

Anterior segment: no abnormality detected BE

Fundus: RE C/D ratio 0.5 LE C/D ratio 0.4 large cups large disc BE

Further ocular exams

AVF: Unable to do AVF as the patient was sleepy

Fundus photo: Healthy neuroretinal rim BE, no notching, no peripapillary atrophy, Positive ISNT, and healthy macular BE.

OCT: No RNFL defects seen, no GCL defects seen

Diagnosis: Normal eyes

Plan: Stop Timoptol, continue with present glasses, IOP check in 1 month (Figure 11).

Importance of OCT in this case

- Useful for patients uncooperative with AVF e.g. elderly and young patients.
- Helped in identifying a false glaucoma diagnosis.

Discussion

The OCT has proven to be a valuable tool in the hands of other eye care professionals and Nigerian optometrists in both the private and public sectors should be able to take advantage of such a tool for the benefit of the patient. Several strategies can be adopted to increase its usage by addressing the reasons behind its limited use. They include

- Pooling of funds by optometrists in the private sector to purchase the equipment as a group. They can also request loans from financial institutions as a group increases the likelihood of the loan being approved compared to when requested individually.
- Leasing or renting the equipment [5].
- Increased funding for the eye care departments of government-run hospitals and centers [6].
- Patients in the private sector can be given a discount for repeat OCT and also on OCT done on family members. This is to encourage family screening for conditions that have familial predispositions such as glaucoma.
- Also, training opportunities can be organized by the associations and professional bodies to help optometrists learn how to operate and interpret OCT results.

Conclusion

The OCT is an invaluable tool in the arsenal of eye care practitioners especially optometrists as they are usually the first point of call for persons accessing eye care services and thus might be the first clinicians to detect sight and even life-threatening conditions. Having the use of the OCT at their disposal will be a plus for the healthcare system by aiding early detection and correct diagnosis and management of ocular conditions.

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