Research Article
Open Access

Swept-source-optical coherence tomography study of choroidal thickness in maculopathy type two diabetes mellitus patients

Abstract

Purpose: To increase our understanding of cellular and structural changes in the Choroidal Thickness in Normal adult cases and diabetic maculopathy (Ischemic and Non- Ischemic types) among Type 2 Diabetes Mellitus patients. We aimed to have a better insight of the disease problem and to have a better patient management.

Methods: Prospective Comparative Control Study. We used swept-source SS OCT in this study to have better three dimensional Choroidal images in healthy & Type two diabetic maculopathy eyes (Ischemic & non-Ischemic types). Study populations included 50 eyes in two groups (control & diabetic group with more than 35years old. We excluded cases cases of pan-retinal photo coagulation PRP, Intravitreal injection triamcinolone or anti- VEGF, glaucoma and refractive error of more than (-6 D or /+3 D).

Results: We found that the mean Choroidal Thickness of patients with Ischemic maculopathy were thinner than those of non Ischemic and healthy groups. Choroidal Thickness decreases as the age increases and with longer diabetic history. The gender effect was insignificant.

Conclusion: SS-OCT imaging allows the non-invasive assessment of anatomical changes in the Choroid, thus explaining poor visual outcome between Diabetic Maculopathy and healthy normal controls. Further studies are required to increase study sample & to study the effects of our therapy on Choroidal Thickness changes.

Keywords: choroidal thickness ct, diabetic maculopathy (ischemic & non ischemic), swept source optical coherence tomography (SS OCT), macular edema, imaging, fluorescein angiography

Volume 8 Issue 4 - 2018

Osama Elbassiouny, Ali Khalil Awadallah, Moataz Sallam, Fatma Soliman

Department of Ophthalmology, Faculty of Medicine (FOM), Egypt

Correspondence: Osama Elbassiouny, Professor of Ophthalmology, Founding Member of Ophthalmology Department, Senior Consultant Ophthalmic Surgeon, FOM, SCU, Ismaillia, Egypt, Email osama.elbassiouny@med.suez.edu.eg

Received: July 31, 2018 | **Published:** August 07, 2018

Introduction

The SS-OCT has a longer wavelength capable of penetrating tissue, thus both vitreous and Choroid can be imaged simultaneously.[1] It uses a tunable Laser as a light source, operated at 100000 Hz. The device can do image averaging of up to 96 B-scans at each location.[2]

Materials & methods

Our study was performed between April 2017 and September 2017, at out-patients clinic (OPD) of Ophthalmic Department, Faculty of Medicine, Suez Canal University Hospital, Ismailia, Egypt. Fifty cases were included in this study. A diabetic group 25 cases (Ischemic & non Ischemic Maculopathy) with or/without macular edema. Detection was performed by Fluorescein Angiography (Zeiss-Visucam 500), Figure 1. Choroidal Thickness CT was evaluated by SS OCT, Figure 2. It provides sectoral analysis and follow-up of retinal pathologies involving the choroid. All SS-OCT examinations were performed between 12 pm and 2 pm to avoid any inclusion of diurnal variations in CT.[3] The macular 3D scan (512X256 A scans/ 0.8 Sec), program of the built-in software was used for our measurements of retinal & Choroidal Thickness. Choroidal Thickness measurement included nine zones. Subfoveal (from the epithelium/Bruch's membrane complex to the sclerochoroidal interface within 6mm) was measured using automatic analysis software. We analyzed for each of the eyes 9 regions of the macular zone in accordance with Early Treatment Diabetic Retinopathy Study (ETDRS). Figure 3 Control group included 25 healthy adult individuals. Figure 4 shows details of retina and choroid as seen by SS-OCT.

Figure 1 Fluorescein Angiography Zeiss-Visucam 500.

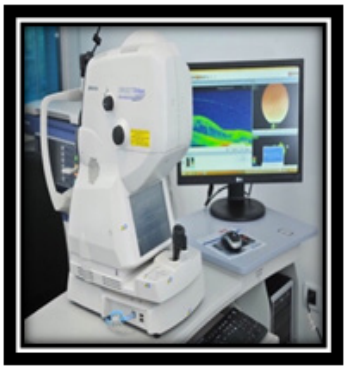

Figure 2 SS OCT Dri-Topcon Japan.

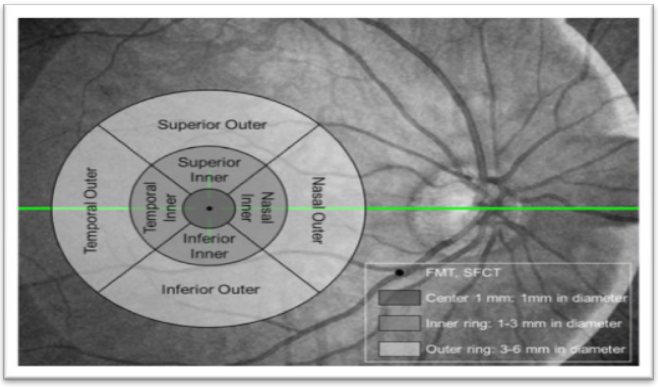

Figure 3 Analyzed regions of retinal and Choroidal Thickness using the ETDRS map.

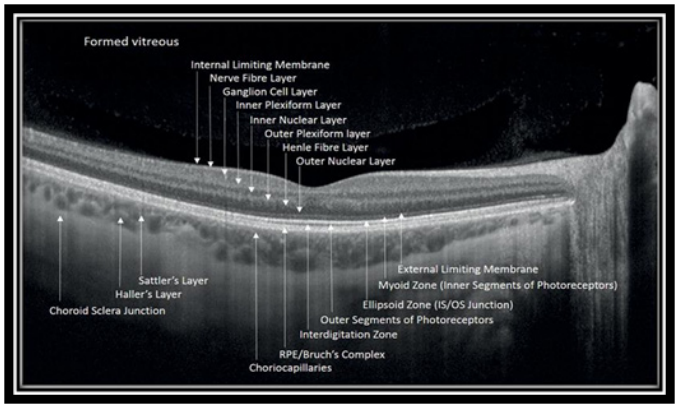

Figure 4 Showing details of Retina & Choroid as seen by SS-OCT.

Results

Our study populations is shown in Table 1. Figure 5 shows CT analysis in our study. Table 2 shows the average thickness of the choroid in each part of macular zone in our study.

Table 1 Study groups basic data

Comparison factors	Diabetic group	Control group
Age(Mean±SE)	62.84±1.93	48.72±2.02
Sex		
Males	4(16%)	13(52%)
Females	21(84%)	12(48%)
Diabetes type II duration	15.84 ±0.74	
Diabetic Ischemic	11(44%)	
Maculopathy Non-ischemic	14(46%)	

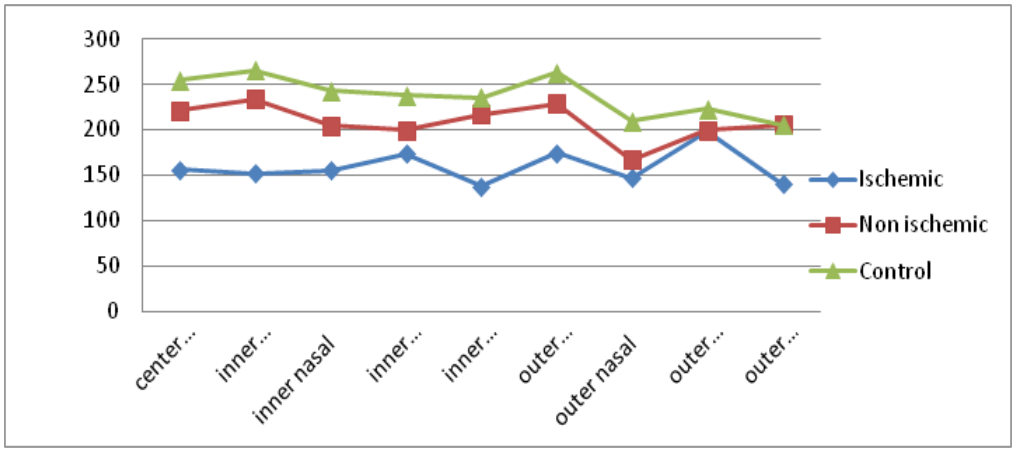

Figure 5 CT of Macular Zone in our study group.

Citation: Elbassiouny O, Awadallah AK, Sallam M, et al. Swept-source-optical coherence tomography study of choroidal thickness in maculopathy type two diabetes mellitus patients. *Adv Ophthalmol Vis Syst.* 2018;8(4):237–240. DOI: 10.15406/aovs.2018.08.00311

Discussion

The current study aimed at assessing CT according to the stages of diabetic Maculopathy (Ischemic & non Ischemic) versus normal control healthy individuals. New OCT image modalities with longer wavelength swept source is used in our work. This technique is better in visualization of the choroid in contrast to indocyanine green angiography & ultrasonography.[4,5] Observing the CT map (Table 2) in the current study revealed that mean CT of the control group was thin nasally (243.36 um for the inner nasal, 209.65um for the outer nasal) increased to (254.88um in sub fovea). The temporal thickness became thinner again (inner 235.76um, outer 205.84um), similar to results obtained.[6] In diabetic group, The choroidal thickness for non ischemic maculopathy diabetic patients was thin nasally (for the inner nasal 204.64um, for the outer nasal 166.86um) increased to (221.5um in the subfovea). The temporal thickness became thinner again (inner 217um, outer 205.57um). For ischemic patients, choroidal thickness nasally (inner 155.82um, outer nasal 147um), subfovea (155.91um) and temporally (inner 137.82um, outer 140.82um).[7–9] i.e. There was significant reduction in macular CT in eyes of patients having ischemic maculopathy as compared to non-ischemic maculopathy and healthy population. Visual loss is most likely to happen in ischemic maculopathy due to thin CT. Methods used to analyze CT may have some conflict if used subfoveal region only.[10] Sex difference was not significant between men & women in all quadrants $p>0.05$.[11] We also found that significant reduction $p<0.001$ of CT with increasing age.[12] We are planning to increase our sample size and study changes for our diabetic hospital inpatient and effects of treatment modalities on Choroidal Thickness.[13]

Table 2 Mean CT in both groups and significant differences

Choroid regions (Mean CT)	Ischemic maculopathy	Non-ischemic Maculopathy	Control	Least squares analysis P value
The center subfovea	155.91	221.5	254.88	0.002**
The inner superior	152.09	233.57	265.44	0.001***
The inner nasal	155.82	204.64	243.36	0.007**
The inner inferior	173.91	199.5	238	0.06
The inner temporal	137.82	217	235.76	0.005**
The outer superior	174.27	229	263	0.016*
The outer nasal	147	166.86	209.56	0.037*
The outer inferior	198.55	199.86	222.76	0.611
The outer temporal	140.82	205.57	205.84	0.025*

Acknowledgements

None.

Conflict of interest

Author declares that there is no conflict of interest.

References

1. Gil-Martinez M, Pastor-Idoate S, Yau K, et al. Wide-field fundus autofluorescence and swept-source-Optical Coherence Tomography imaging after successful retinal detachment surgery. *Adv Ophthalmol Vis Syst*. 2018;8(3):139–143.
2. Ruiz-Medrano J, Flores-Moreno I, Pena-Garcia P, et al. Macular Choroidal Thickness profile in a healthy population measured by swept-source Optical Coherence Tomography. *Investigative ophthalmology and visual science*. 2014;55(6):3532–3542.
3. Han Y, Lim H, Lee S, et al. Diurnal variations in Choroidal and retinal thickness of the early treatment of diabetic retinopathy study macular subfields determined using swept-source optical coherence tomography. *Ophthalmologica*. 2015;233(3–4):192–197.
4. Mansoura k, Medeiros FA, Marchase N, et al. Assessment of Choroidal Thickness and volume during the water drinking test by swept-source Optical Coherence Tomography. *Ophthalmology*. 2013;120(12):2508–2516.
5. Montero JA, Ruiz-Moreno JM. Choroidal thickness study using swept-source optical coherence Tomography. *Supplement to Retina Today*. 2013:1–8.
6. Manjunath V, Goren J, Fujimoto JG, et al. Analysis of choroidal thickness in age-related macular degeneration using spectral-domain optical coherence tomography. *American journal of ophthalmology*. 2011;152(4):663–668.
7. Regatieri C, Branchini L, Fujimoto J, et al. Choroidal imaging using spectral-domain optical coherence tomography. *Retina*. 2012;32(5):865–876.
8. Sheth J, Giridhar A, Rajesh B, et al. Characterization of macular Choroidal Thickness in Ischemic and non-Ischemic diabetic Maculopathy. *Retina*. 2017;37(3):22–528.
9. Kim JT, Lee DH, Joe SG, et al. Changes in choroidal thickness in relation to the severity of retinopathy and macular edema in type 2 diabetic patients. *Investigative ophthalmology & visual science*. 2013;54(5):3378–3384.
10. Ünsal E, Eltutar K, Zirtiloğlu S, et al. Choroidal thickness in patients with diabetic retinopathy. *Clinical Ophthalmology*. 2014;8:637–642.

11. Moussa M, Sabry D, Soliman W. Macular choroidal thickness in normal Egyptians measured by swept source optical coherence tomography. *BMC ophthalmology*. 2016;16(1):138.

12. Curcio C, Johnson M, Huang J, et al. Aging, age-related macular degeneration, and the response-to-retention of apolipoprotein B-containing lipoproteins. *Progress in retinal and eye research*. 2009;28(6):393–422.

13. Jo Y, Ikuno Y, Iwamoto R, et al. Choroidal thickness changes after diabetes type 2 and blood pressure control in a hospitalized situation. *Retina*. 2014;34(6):1190–1198.

Citation: Elbassiouny O, Awadallah AK, Sallam M, et al. Swept-source-optical coherence tomography study of choroidal thickness in maculopathy type two diabetes mellitus patients. *Adv Ophthalmol Vis Syst.* 2018;8(4):237–240. DOI: 10.15406/aovs.2018.08.00311