Enhanced Depth Imaging Optical Coherence Tomography: A Study of the Choroid in High Axial Myopia

A Thesis

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Samar Osama Ahmed El Gharib Zayed

List of Contents

List of Abbreviations

Abbr.	Full-term
AC	**:** Anterior chamber
ACD	**:** Anterior chamber depth
ANOVA	**:** Analysis of variance
AXL	**:** Axial length
CI	**:** Confidence interval
CNV	**:** Choroidal neovascularization
CSI	**:** Choroidal scleral interface
CT	**:** Choroidal thickness
D	**:** Diopter
EDI	**:** Enhanced depth imaging
EDI-OCT	**:** Enhanced depth imaging optical coherence tomography
ICN	**:** Intrinsic choroidal neuron
ILM	**:** Internal limiting membrane
IOP	**:** Intraocular pressure
Log-MAR	**:** Logarithm of the minimum angle of resolution
LYVE-1	**:** Lymphatic vessel endothelial hyaluronan receptor1
MFS	**:** Myopic foveoschisis
NADPH	**:** Nicotinamide adenine dinucleotide phosphate hydrogen
Nnos	**:** Neuronal nitric oxide synthase
NO	**:** Nitric oxide
OCT	**:** Optical coherence tomography

PDPM : Peripapillary detachment in pathologic myopia
PED : Pigmented epithelial detachment
PM : Pathological myopia
PVD : Posterior vitreous detachment
RPE : Retinal Pigmented Epithelium
SD : Standard deviation
SD-OCT : Spectral domain optical coherence tomography
SE : Standard error
SFCT : Subfoveal choroidal thickness
UCVA : Uncorrected visual acuity
VA : Visual acuity
VIP : Vasoactive intestinal peptide
β : Regression coefficient

List of Tables

List of Figures

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Abstract

Background: High myopia is one of the main causes of visual impairment worldwide. About 1% of the population has high myopia. There is significant evidence from research with animal models and humans that the development of refractive errors is associated with changes in the structural characteristics of the choroid. Studies from a range of different animal species, including chicks, macaque monkeys, indicate that alterations in choroidal thickness (CT) can precede and accompany the development of myopic refractive errors. **Aim of the Work:** The aim of this study is to evaluate the choroid by Enhanced Depth Imaging OCT, as regards its morphology and thickness in high axial myopic patients. **Patients and Methods:** The controlled cross sectional study that was conducted on a consecutive series of subjects attending Ain Shams University Ophthalmology Department outpatient clinic. The patients were divided into two groups: Study group (group I): includes 100 high axial myopic eyes (more than -6.00 diopters) and Control group (group II): includes 100 emmetropic eyes. **Results and Conclusion:** Our study along with the comprehensive meta-analysis showed that the choroidal thickness is significantly lower in high myopic eyes than control emmetropic eyes. UCVA, AL and the presence of posterior staphyloma are the significant predictors of CT in high myopia and must be taken into account when interpreting the data on CT. Given the large number of people with myopia in the world, these findings seem to have widespread implications.

Key words: enhanced depth imaging, OCT, choroid, axial myopia

Introduction

High myopia (defined as -6.00 D or more) is one of the leading causes of visual impairment in the world ***(Hayashi et al., 2010).***The prevalence of high myopia, varies according to ethnic groups and countries. It is more common in Asian population with rates of 9-12% in comparison to 2-4% in white population ***(Lin et al., 2004).***

In high myopia, excessive high axial elongation of the globe can cause biomechanical stretching and thinning of choroid and RPE (retinal pigmented epithelium) ***(Jonas et al., 2014).*** The axial length is a parameter that rarely changes after growth period, around 20 years of age, whereas posterior staphyloma can increase with high myope at adulthood ***(Takahashi et al., 2012).***

It was found that the choroidal thickness is correlated to high myopia, the choroid in high myopia has been demonstrated to be markedly thinner compared to normal eye (170-220 um) both histologically ***(Grossniklaus &Green., 1992)*** and with Spectral Domain-Optical Coherence Tomography (SD-OCT). Histologic studies demonstrated that this choroidal thinning is due to significant thinning of the choriocapillaris and focal lack of vessels ***(Caio et al., 2012).***

Choroidal thickness is important for understanding and evaluating various choroidal pathologies. With increasing knowledge and technological advances, SD-OCT becomes an