STUDY OF MACULAR THICKNESS IN RELATION TO AXIAL LENGTH IN MYOPIC EYES

THESIS

Submitted for partial fulfillment of

The MD degree in Ophthalmology

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Cairo - 2014

Acknowledgment

First of all, I want to thank ***God*** for all things He has blessed and still blessing me with, without which I would not be able to finish this work.

I would like to acknowledge ***Prof. Dr. Ali Hassan Saad***, Professor of Ophthalmology, Ain Shams University, for his kind supervision and constant support which expressed itself in several ways during working on this thesis. Despite his busy program his door was always open for my questions and official inquires. His advice and patience are appreciated.

I am deeply indebted to ***Ass. Prof. Dr. Mona Mohamed El-Fiky***, Assistant Professor of Ophthalmology, Ain Shams University, for promoting me almost from the very beginning of my postgraduate studies and gaining of my Master degree in ophthalmology. She taught me a lot and took a very special care of me during working in my Master essay and then in this thesis. Without her help, both works would not be possible.

I am more thankful than I can say to my advisor ***Dr. Reham Fawzy El-Shinnawy***, Lecturer of Ophthalmology, Ain Shams University, for her continuous support, patience, motivation, enthusiasm, and immense knowledge. I cannot thank her adequately for all the effort she made to understand me and to bring out the best in me. Her guidance helped me in all the time of research and in writing of this thesis.

I still remember the excitement of working and our cooperation in the paper emerged from this thesis; this was my first introduction to

research and it was published in Scientific Events of the Egyptian Ophthalmological Society, 2011, volume 4.

Last but not the least; I would like to thank my family for supporting me spiritually throughout my life. I am really grateful to ***My Mother***, the greatest mother ever, for her love, care, patience and continuous encouragement. She creates the calm and pleasant atmosphere that helps me to complete this work. She suffers a lot to educate and help me to be as I am. Without her I could not achieve any success in my life. I really appreciate ***my dear brother; Mohamed*** for his generous care and support throughout this work and my whole life, and ***my dear sister; Aya*** for her amazing love and kind share in editing photos in this thesis.

Also I would like to thank my dear professors in the ***Egyptian Eye Academy*** for their kind help and support to fulfill the practical part of this work, and many thanks to the whole Academy staff. I cannot forget to thank my dear friends and colleagues for their generous support and encouragement.

Doaa Ramadan

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Protocol

Myopia is the state of refraction in which parallel rays of light are brought to focus in front of the retina of a resting eye. Myopia is measured by the spherical power in diopters of the diverging lens needed to focus light onto the retina and it can be expressed as the spherical equivalent or refraction in the least myopic meridian **[Curtin, 1988]**.

Traditionally, myopia has been classified as either refractive or axial in nature. The refractive-type errors are attributed to curvature changes in cornea and/or lens, and/or refractive index shifts in either the cortex or nucleus of the lens. Axial myopia refers to the errors brought about by increased axial length **[Saw, et al, 1996]**. Axial length was widely regarded as the primary determinant of myopic refractive error. Myopic eyes with primarily an axial component may have a greater risk of progression than their refractive counterparts with the same degree of refractive error **[Bakaraju, et al, 2009]**.

Patients with high myopia (spherical equivalent at least -6.0 D) are more susceptible to ocular abnormalities. Higher risks of cataract and glaucoma in myopic patients were reported. Myopic adults were more likely to have tilted, rotated, and larger discs as well as other optic disc abnormalities **[Saw, et al, 2005]**. Excessive axial elongation of the globe in high myopia can cause mechanical stretching and thinning of the choroid and retinal

pigment epithelium layers, resulting in various retinal degenerative changes such as retinal tears, retinal detachment, posterior staphyloma, chorioretinal atrophy, retinal pigment epithelial atrophy, lacquer cracks, choroidal neovascularisation (CNV) and macular hemorrhage **[Lai, 2007]**.

Optical coherence tomography (OCT) is a new noninvasive technique that can be used to measure retinal thickness using time delays of reflected or backscattered light and interferometry **[Hee, et al, 1995]**. Compared with fundus examination, OCT showed unique preference for observation of the changes of retinal pigment epithelium (RPE), chorio-capillary layer, diagnosis macular hole and epiretinal macular membrane, discovery of small sensory retinal detachment, schisis and thinning of sensory retina layer **[Wang, et al, 2004]**.

Previous studies showed that retinal thickness is related to refractive error/axial length in normal subjects with regional variations within the 6-mm macular region **[Lam, et al, 2007]**. Axial myopia in children was associated with reduced macular thickness and volume suggesting early anatomic changes in their retinas **[Luo, et al, 2006]**. The retina of individuals with high myopia are thicker in the fovea, but thinner in the inner and the outer macular region and had smaller macular volume than those of non-myopia **[Wu, et al, 2008] [Xie, et al, 2009]**.

Some studies found that all macular thickness and volume parameters statistically significantly decreased with increasing age **[Tewari, et al, 2004] [Neuville, et al, 2009]**, although the central fovea showed only a slight decreased thickness **[Sung, et al, 2009]**.

Study Plan

Subjects:

The study will include 200 randomly selected eyes which will be categorized into five groups:

- 40 moderate myopic eyes (-2.00 to -6.00D) in young adult population (20-40 years).
- 40 moderate myopic eyes (-2.00 to -6.00D) in old age population (more than 40 years).
- 40 severe myopic eyes (more than -6.00D) in young adult population (20-40 years).
- 40 severe myopic eyes (more than -6.00D) in old age population (more than 40 years).
- 40 emmetropic to mild myopic eyes (less than -2.00D) as a control group.

Methods: All eyes will undergo:

1. **History taking.**

2. **Full ophthalmological examination including:**
   - Visual acuity,
   - Refraction,
   - keratometry,
   - Slit lamp examination,
   - Applanation tonometry,
   - Fundus examination.

3. Investigations that will include:

- Measurement of axial length by A-scan ultrasonography,
- Measurement of macular thickness with Stratus OCT using the fast macular thickness map protocol with foveal fixation analyzed by macular thickness/volume tabular program.

Exclusion Criteria:

- Refractive myopia of corneal power greater than 44D in the least myopic meridian,
- Concurrent systemic diseases that are expected to affect the macula as diabetes mellitus,
- Medications with risk of macular affection as chloroquine or interferon,
- Posterior segment pathology,
- Past history of intraocular surgery or trauma.

The data will be collected then it will be statistically analyzed.

Aim of the Work

The aim of current study is to investigate the relationship between axial myopia and macular thickness compared to emmetropic eyes, as measured by optical coherence tomography and to establish standard values for macular thickness in myopic eyes of different degrees in different ages.

List of Abbreviations

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°	degree	3
µm	micrometer	4
ANOVA	one-way analysis of variance	72
ATP	adenosine tri-phosphate	15
BCVA	best corrected visual acuity	50
CNV	choroidal neovascularization	19
D	diopter	11
ELM	external limiting membrane	5
ETDRS	Early Treatment Diabetic Retinopathy Study	46
FAZ	foveal avascular zone	9
H&E	hematoxilin and eosin	2
ILM	inner limiting membrane	9
INL	inner nuclear layer	7
IOP	intraocular pressure	51
IPL	inner plexiform layer	7
IS/OS	inner segment/outer segment	107
K	keratometry	50

m/sec	meter per second	54
MAR	minimal angle of resolution	61
mm	millimeter	1
NFL	nerve fiber layer	8
nm	nanometer	9
OCT	optical coherence tomography	35
ONL	outer nuclear layer	6
OPL	outer plexiform layer	6
p	probability	72
PVD	posterior vitreous detachment	25
r	Pearson's correlation coefficient	72
RPE	retinal pigment epithelium	4
RTA	retinal thickness analyzer	36
SE	spherical equivalent	11
VA	visual acuity	50