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Optical Coherence Tomography and Optical Coherence Tomography Angiography Findings in Amblyopic Patients

Thesis

Submitted for Partial Fulfillment of Master Degree in Ophthalmology

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2021

Acknowledgments

First and foremost, I feel always indebted to **ALLAH,**
the Most Kind and Most Merciful.

I'd like to express my respectful thanks and profound gratitude to **Prof. Dr. Azza Mohamed Ahmed Said,** *Professor of Ophthalmology, Faculty of Medicine, Ain Shams University for her keen guidance, kind supervision, valuable advice and continuous encouragement, which made possible the completion of this work.*

I am also delighted to express my deepest gratitude and thanks to **Dr. Mahmoud Ahmed El Samkary,** *Assistant professor of Ophthamology, Faculty of Medicine, Ain Shams University, for his kind care, continuous supervision, valuable instructions, constant help and great assistance throughout this work.*

I am deeply thankful to **Dr. Islam Abdallah Mohalhal Soliman,** *Assistant professor of Ophthalmology, Research Institute of Ophthalmology, for his great help, active participation and guidance.*

Marwa Salah

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List of Abbreviations

Abb.	Full term
BBV	Balanced binocular viewing
BCVA	Best corrected visual acuity
CCD	Charge-coupled device
cpRNFL	Circumpapillary retinal nerve fiber layer
CT	Choroidal thickness
DCP	Deep capillary plexus
DE	Dominant eye
EDI	Enhanced depth imaging
ELM	External limiting membrane
FAZ	Foveal avascular zone
FD-OCT	Fourier domain optical coherence tomography
FFA	Fundus fluorescein angiography
FMT	Foveal minimum thickness
GCL	Ganglion cell complex
GCL	Ganglion cell layer
I-BiT	Interactive binocular treatment
ICGA	Indocyanine green angiography
ILM	Internal limiting membrane
INL	Inner nuclear layer
IPL	Inner plexiform layer
Mrnfl	Macular retinal nerve fiber layer
NDE	Non-dominant eye
OCT	Optical coherence tomography
OCTA	Optical coherence tomography angiography
ONH	Optic nerve head
ONL	Outer nuclear layer

List of Abbreviations Cont...

Abb.	Full term
OPL	Outer plexiform layer
RNFL	Retinal nerve fiber layer
SCP	Superficial capillary plexus
SD-OCT	Spectral domain Optical coherence tomography
SS-OCT	Swept-source optical coherence tomography
TD-OCT	Time domain optical coherence tomography
VD	Vascular density

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INTRODUCTION

Amblyopia is the most common vision deficit in children, affecting 2–5% of children in the UK and the second most common cause of functional low vision in children in low-income countries. Unilateral amblyopia is a developmental defect of vision, and has two main causes: (i) a difference in the optical properties of the two eyes, reflected in a different spectacle prescription for the right and the left eye (anisometropia) and (ii) strabismus (misalignment of the visual axes). Some children have both anisometropic and strabismic amblyopia (‘combined’ or ‘mixed mechanism’ amblyopia) ***(Tailor et al., 2016).***

A study was made by ***Rashad et al., 2018*** to measure the prevalence of amblyopia among primary school children in central Cairo which was 1.49% another study was made in Minia University showed same prevalence of amblyopia ***(Abdelrazik and Khalil, 2014).***

Rarely, congenital or early childhood obstruction of the visual axis, for example by lid ptosis or by opacities of the cornea, crystalline lens or vitreous, can give rise to amblyopia by deprivation, as the retina does not receive a clear image ***(Tailor et al., 2016).***

Although it has been reported that amblyopia primarily causes cerebral anatomical alterations in lateral geniculate

bodies and the visual cortex, it can also affect retinal layers and vascular structures ***(Karabulut et al., 2019).***

The pathophysiology of amblyopia has not been fully defined. Neuroanatomy and neurophysiology studies have equated the hypothesis that retinal functional changes are involved in the development of amblyopia ***(Sobral et al., 2018).*** However, the nature of the retina's involvement remains unclear ***(Bruce et al., 2013).***

A large number of studies have been recently performed to assess the structural variations in retinal nerve fiber layer (RNFL) in eyes with amblyopia. Contrary to the general belief that the amblyopic eyes are structurally normal, significant alterations have been found in the RNFL, ganglion cell complex and foveal thickness in patients with amblyopia. However, a consensus on retinal abnormalities has not been reached ***(Bitirgen et al., 2019).***

Another region under investigation in amblyopic eyes is the choroid. ***Spaide et al., 2008*** defined enhanced depth imaging (EDI) method using conventional spectral-domain optical coherence tomography (SD-OCT). This new procedure enables measurement of the choroidal thickness (CT) at different locations within the macular and peripapillary regions. Recent studies have reported an increase in macular CT in amblyopic eyes ***(Bitirgen et al., 2019).***