Advances and Emerging Applications of Spectral Domain Optical Coherence Tomography Imaging in Ophthalmology

Essay

Submitted for Partial fulfillment Of Master Degree in Ophthalmology

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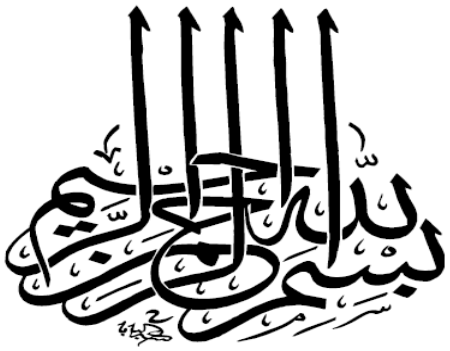
Cairo-2013



﴿قَالُوا سُبْحَانَكَ لَا عِلْمَ لَنَا
إِلَّا مَا عَلَّمْتَنَا إِنَّكَ أَنْتَ
الْعَلِيمُ الْحَكِيمُ﴾

سورة البقرة آية
رقم:(32)

Acknowledgement

First of all thanks for Allah, to whom I relate any success in achieving any work in my life.

I would like to express my thanks and grateful appreciation to ***Prof. Dr. Alaa Fathy Mahmoud,*** *Professor of ophthalmology, Faculty of Medicine, Ain shames University, for his valuable advice and kind encouragement.*

I would also like to express my thanks and sincere gratitude to ***Assistant Prof. Dr. Mohammad Ahmad Rashad****, assistant professor of ophthalmology, Faculty of Medicine, Ain Shams University, for his kind close supervision, valuable advice and unlimited guidance.*

Last but not least, I want to thank my family for their endless encouragement and support.

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Chapter 3:Polarization sensitive SDOCT.

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3D- OCT	Three dimensional OCT
3D-SDOCT	Three dimensional spectral domain OCT
AMD	Age related macular degeneration
BIOM	Binocular Indirect Ophthalmo Microscope
BRVO	Branch retinal vein occlusion
CCD	Charge-coupled device
CNV	Choroidal neovascularization
CSCR	Central Serous Chorioretinopathy
dA	Differential area
DALK	Deep Anterior Lamellar Keratoplasty
DOCT	Doppler OCT
DOPU	Degree of polarization uniformity
DOPUmin	Minimal DOPU value
DSAEK	Descemet's stripping automated endothelial keratoplasty
EDI	Enhanced Depth Imaging
ELM	External limiting membrane
FDOCT	Fourier domain OCT
GCL	Ganglion cell layer
IJT	Idiopathic Juxtafoveal Telangiectasia
ILM	Internal limiting membrane
INL	Inner nuclear layer
IPL	Inner plexiform layer,
IS/OS	Inner segment/outer segment parts of photoreceptors
LASIK	Laser Assisted in Sito Keratomileusis
MMOCT	Microscope Mounted OCT
NAION	Nonarteritic Ischemic Optic Neuropathy
OCT	Optical coherence tomography

ODT	Optical Doppler tomography
OMAG	Optical Micro-Angiography
ONH	Optic nerve head
ONL	Outer nuclear layer
OPL	Outer plexiform layer
PDR	Proliferative diabetic retinopathy
PED	Pigment epithelial detachement
PFO	Perfluoro-n-octane
PR-DOCT	Phase Resolved DOCT
PS SDOCT	polarization sensitive SDOCT
PSL	Polarization scrambling layer
PSOCT	Polarization sensitive OCT
QWP	Quarter wave plate
RNFL	Retinal nerve fiber layer
ROP	Retinopathy of prematurity
RPE	Retinal pigment epithelium
RT	Retinal thickness
s	Surface of blood vessel
SDOCT	Spectral domain OCT
SLD	Superluminescent diode
SLO	Scanning laser ophthalmoscope
SVP	Summed Voxel Projection
TDOCT	Time domain OCT
TRBF	Total retinal blood flow
UHR SDOCT	Ultrahigh resolution SDOCT

UHR TDOCT	Ultrahigh resolution TDOCT
v	Velocity vector
$\mathbf{v}_z$	Doppler flow velocity
VF	Visual field
VKH	Vogt Koyanagi Harada
θ	Doppler angle

Introduction

Optical coherence tomography (OCT), first reported as retinal imaging tool in 1991, is an interferometric tool for 3D imaging of objects hidden in scattering media such as the human eye **(Huang et al., 1991).**

Spectral domain optical coherence tomography (SDOCT) provides a number of advantages over conventional time domain OCT (TDOCT) systems**,** SDOCT offers higher acquisition speed and thus the ability to obtain significantly more images in a shorter period of time. This increased speed minimizes patient movement artifact and improves image resolution, the higher resolution obtained with SDOCT imaging may improve the detection of abnormalities **(Gupta et al .,2008).**

Doppler OCT (DOCT) imaging enables 3D visualization of the chorioretinal vasculature as in exudative macular diseases **(Makita et al., 2006)**.
Exudative macular diseases include age-related macular degeneration (AMD), which is the major cause of severe loss of central vision **(Klein et al., 1991)**.

Conventional intensity based OCT achieves a high depth resolution of a few μm and can resolve several retinal layers, however it cannot directly differentiate different tissues. Polarization sensitive OCT (PSOCT) takes advantage of the additional polarization information carried by the reflected light and can thereby reveal important