Comparison between B-scan Ultrasonography and Optical Coherence Tomography in Evaluation of Macular Oedema

Thesis

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Amira Sabry Abd El Aziz

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List of Abbreviations

Abb.	Full term
µm	micrometer
3D	Three Dimensional
AE	Anterior to the Equator
AMD	Age Related Macular Degeneration
BCVA	Best Corrected Visual Acuity
BRVO	Branch Retinal Vein Occlusion
CF	Counting Fingers
CME	Cystoid Macular Edema
CNV	Choroidal Neovascularization
COST	Cone Outer Segment Tip
CRA	Central Retinal Artery
CRT	Central Retinal Thickness
CRV	Central Retinal Vein
CRVO	Central Retinal Vein Occlusion
dB	Decibel
DM	Diabetes mellitus
DME	Diabetic Macular Edema
DMT	Diffuse macular thickening
DR	Diabetic Retinopathy
DRT	Diffuse Retinal Thickness
E	Equator
ELM	External Limiting Membrane
ERM	Epiretinal Membrane
ETDRS	Early Treatment Diabetic Retinopathy Study
FA	Fluorescein angiography
FAF	Fundus Autofluorescence
GCL	Ganglion Cell Layer
HIF-1α	Hypoxia-inducible factor 1-alpha
HM	Hand Motion
HRVO	Hemiretinal vein occlusion
HTN	Hypertension
ICP	Intra Cranial Pressure

List of Abbreviations cont...

Abb.	Full term
IL	Interleukins
ILM	Internal Limiting Membrane
INA	Inferior Nasal Artery
INL	Inner Nuclear Layer
IOP	Intra Ocular Pressure
IPL	Inner Plexiform Layer
IS/OS	Inner segment/outer segment photoreceptor junction
ITA	Inferior Temporal Artery
JRT	Juxtafoveal Retinal Telangiectasis
L	Longitudinal Scan
ME	Macular edema
MHz	Megahertz
Nd:YAG	Neodymium:Yttrium Aluminum Garnet
NFL	Nerve fiber Layer
OCT	Optical Coherence Tomography
ONL	Outer Nuclear Layer
OPL	Outer Plexiform Layer
PE	Posterior to the Equator
PHT	Posterior hyaloid Traction
PL	Perception of Light
PRP	Panretinal Photocoagulation
PVD	Posterior Vitreous Detachment
RAPD	Relative afferent pupillary defect
RMG	Retinal Muller Glial cells
ROP	Retinopathy of prematurity
RP	Retinitis Pigmentosa
RPE	Retinal pigment epithelium
RVO	Retinal Vein Occlusion
SD	Spectral Domain
SLD	Super Luminescent Diode
SLO	Scanning laser ophthalmoscopy
SNA	Superior Nasal Artery

List of Abbreviations cont...

Abb.	Full term
SRD	Serous Retinal Detachment
SRF	Subretinal Fluid
STA	Superior Temporal Artery
T	Transverse Scan
TD	Time Domain
TNF-α	Tumor necrosis factor-α
TRD	Tractional Retinal detachment
U/S	Ultrasound
UVR	Ultra Violet Rays
VA	Visual Acuity
VEGF	Vascular endothelial growth factor
VMT	Vitreomacular Traction Syndrome

INTRODUCTION

Macular edema is a common phenomenon in various diseases where fluid accumulates in between the retinal cells. The fluid originates from the intravascular compartment. The focal, diffuse, and cystic forms are all characterized by extracellular accumulation of fluid, specifically in Henle's layer and the inner nuclear layer of the retina. The compartmentalization of the accumulated fluid is likely to be due in part to the relative barrier properties of the inner and outer plexiform layers ***(Tranos et al., 2004).***

The classic pattern of cystoid macular edema (CME) with the petaloid appearance originating from the fluorescein leakage from perifoveal capillaries may be seen in cases of advanced edema of various origins. This includes postsurgical CME as well as CME associated with one of the following conditions: diabetes, vascular occlusion, hypertensive retinopathy, epiretinal membranes, intraocular tumors (e.g., melanoma, choroidal hemangioma), intraocular inflammation (e.g., pars planitis), macroaneurysm, retinitis pigmentosa, choroidal neovascularization, and radiation retinopathy ***(Tranos et al., 2004).***

Cystoid macular edema may have severe implications for the function of the retina, including decreased visual acuity and contrast sensitivity. Acute or chronic edema causes anatomical disruption that may result in cellular dysfunction and death.

Treatment of CME is important because chronic edema may result in degenerative changes in the macula and permanent loss of vision ***(Brown et al., 2011).*** In addition, large cystic changes in the retina may lead to thinning and loss of inner retinal tissue, or the formation of lamellar hole ***(Tsukada et al., 2011).***

Early detection of CME is critical for diagnosis and management. Traditional methods of assessing macular edema include contact and noncontact slit lamp biomicroscopy, indirect ophthalmoscopy, fluorescein angiography (FA), and fundus stereo photography. However the interpretation of their results can be subjective, and subtle changes in retinal thickness in early CME may not be evident.

Optical coherence tomography (OCT) correlates well with retinal histology and can be used to quantitatively and qualitatively monitor retinal thickness over time. Compared to biomicroscopy and FA, OCT is more sensitive in detection of macular edema and subretinal fluid, and subclinical macular edema is often only detected by OCT ***(Hee et al., 1995a).***

Fluorescein angiography and OCT have limitations. Both tests require the ocular media to be of sufficient clarity to image the retina. Yet in certain patients, opacities in the ocular media limit biomicroscopy, FA, and OCT. Furthermore, a high degree of patient cooperation is required to ensure reliable and accurate testing. However, certain patients, such as children,

often cannot tolerate a FA or follow the specific fixation instructions for OCT testing.

Ophthalmic ultrasonography is a well-accepted noninvasive diagnostic tool. Ultrasonography has the advantage of reliably imaging the posterior segment regardless of the ocular media status. Furthermore, ultrasonography is less dependent on patient cooperation for reliable testing than either FA or OCT ***(Fisher et al., 1991).***