شبكة المعلومات الجامعية

التوثيق الإلكتروني والميكروفيلم

بسم الله الرحمن الرحيم

HANAA ALY

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جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات

يجب أن

تحفظ هذه الأقراص المدمجة بعيدا عن الغبار

HANAA ALY

Comparative Study of the Central Corneal Thickness in Healthy Individuals and Diabetic Patients with and without Retinopathy using Anterior Segment Optical Coherence Tomography

Thesis

Submitted for Partial Fulfillment of Master Degree in Ophthalmology

By

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وَقُل رَّبِّ
أَنزِلْنِي مُنزَلًا مُّبَارَكًا
وَأَنتَ خَيْرُ الْمُنزِلِينَ

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List of Abbreviations

Abb.	Full term

AC ..... *Anterior chamber*

AGEs ..... *Advanced glycation end products*

AS-OCT ..... *Anterior segment OCT*

CCT ..... *Central corneal thickness*

CXL ..... *Corneal collagen crosslinking*

DALK ..... *Deep anterior lamellar keratoplasty*

DED ..... *Dry eye disease*

DM ..... *Descemet's membrane*

DM ..... *Diabetes mellitus*

DR ..... *Diabetic retinopathy*

DSAEK ..... *Descemet's stripping automated endothelial keratoplasty*

ECD ..... *Endothelial cell density*

ECM ..... *Extracellular matrix*

FD- OCT ..... *Fourier- domain OCT*

IOP ..... *Intraocular pressure*

LASIK ..... *Laser in-situ keratomileusis*

MMPs ..... *Metalloproteinases*

NDR ..... *Nondiabetic retinopathy*

NPDR ..... *Nonproliferative diabetic retinopathy*

OCT ..... *Optical coherence tomography*

OSSN ..... *Ocular surface squamous neoplasia*

PDR ..... Proliferative diabetic retinopathy

PRP ..... *Panretinal laser photocoagulation*

SD ..... *Standard deviation*

TD- OCT ..... *Time- domain OCT*

UBM ..... *Ultrasound biomicroscopy*

INTRODUCTION

Worldwide, the incidence of type II diabetes mellitus (DM) is increasing, reaching epidemic proportions in developing countries. The disease entity is characterized by hyperglycaemia and the development of micro- and macrovascular disorders, leading to functional and metabolic disorders in several organs.

In addition to well-recognized ocular complications of DM, such as diabetic retinopathy, cataract progression, and neovascular glaucoma, DM impacts multiple ocular tissues including the cornea as chronic abnormal glucose metabolism leads to corneal changes that have been reported in the epithelial, stromal, and endothelial layers.

Stromal changes include structural alterations produced by collagen crosslinking. Epithelial manifestations include recurrent corneal erosions, punctate keratopathy, persistent epithelial defect and increased susceptibility to ulceration. Diabetic neurotrophic keratopathy which results in endothelial cell dysfunction, can be one of the components of diabetic polyneuropathy ***(Kumar et al., 2018).***

Endothelial cells are proven to have morphologic abnormalities such as decrease in endothelial cell density (ECD) and hexagonality and increase in polymegathism, pleomorphism, and central corneal thickness (CCT). Damaged corneal endothelium function unbalances stromal hydration and

increases its thickness. Some studies suggest that increased CCT could be one of the earliest changes in the diabetic eye and that there is a positive association between CCT and the degree of diabetic retinopathy ***(Norvydaite et al., 2014).***

It is thought that diabetes reduces the activity of Na-K ATPase of corneal endothelium and this increases the hydration of the corneal stroma and then corneal thickness is increased ***(Altay et al., 2016).***

Optical coherence tomography (OCT) is a non-contact optical signal acquisition and processing device that provides magnified, high resolution cross-sectional images of ocular tissues. Development of anterior segment OCT (AS-OCT) offers the benefits of fine resolution and noninvasive examination of the anterior segment anatomy to the depth of the iris plane. This imaging device has been utilized for investigating a variety of corneal and anterior segment diseases ***(Jancevski and Foster, 2010)***.

Technological advances toward three-dimensional visualization broaden the scope of AS-OCT in ophthalmologic evaluation. The AS-OCT is a valuable imaging tool whose use in research and clinical practice will continue to expand our knowledge and management of various ophthalmic conditions ***(Jancevski and Foster, 2010)***.

Aim of the Work

Assessment of the central corneal thickness in diabetic patients with and without diabetic retinopathy using AS-OCT.

Chapter (1)
ANATOMY OF CORNEA

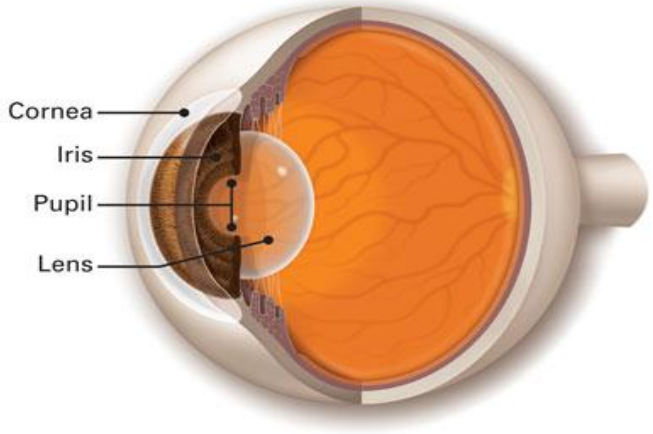

Figure (1): Anatomy of cornea ***(DelMonte and Kim, 2011)***.

The cornea is a transparent avascular tissue that acts as a structural barrier and protects the eye against infections as shown in [figure 1] ***(DelMonte and Kim, 2011)***. Along with the tear film, it provides proper anterior refractive surface for the eye.

The cornea is horizontally oval, measuring 11–12 mm horizontally and 9–11 mm vertically ***(Fares et al., 2012).*** It is convex and aspheric. The anterior curvature is 7.8 mm and posterior curvature is about 6.5 mm. Cornea contributes to about 40–44 D of refractive power and accounts for approximately 70% of total refraction. The refractive index of the cornea is 1.376. There is a gradual increase in thickness from central cornea to the periphery ***(Feizi et al., 2014).***

The cornea is made up of cellular and acellular components. The cellular components include the epithelial cells, keratocytes, and endothelial cells. The acellular component includes collagen and glycosaminoglycans. The epithelial cells are derived from epidermal ectoderm. The keratocyte and endothelial cells are derived from neural crest. The corneal layers include epithelium, Bowman's layer, stroma, Descemet's membrane, and endothelium as shown in [Figure 2]. Recently, a layer of cornea (Dua layer) which is well defined, acellular in pre-Descemet's cornea is getting attention with the development of lamellar surgeries ***(Dua et al., 2013).***

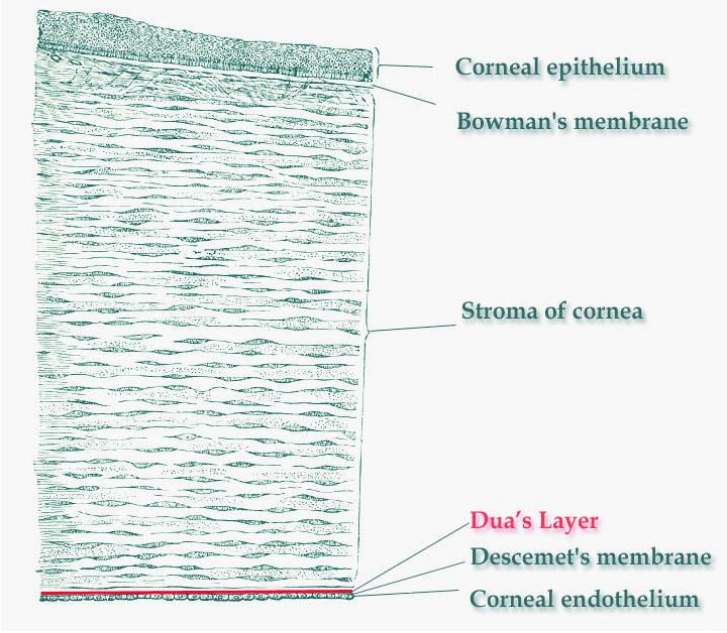

Figure (2): Layers of cornea ***(Dua et al., 2013).***

The corneal epithelium is composed fairly uniformly of 5–7 layers of cells. It is about 50 μ in thickness. The epithelium