بسم الله الرحمن الرحيم

MONA MAGHRABY

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

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جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

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MONA MAGHRABY

Corneal epithelial mapping in different corneal conditions

Thesis

Submitted for Partial Fulfillment of the Master Degree in Ophthalmology

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List of Abbreviations

Abb.	Full term
CET	Corneal epithelial thickness
CMTF	Confocal microscopy through-focusing
CXL	Corneal collagen crosslinking
ECM	Extracellular matrix
ICRS	Intrastromal corneal ring segment
MMPs	Matrix metalloproteinases
OCT	Optical coherence tomography
pIOL	Phakic intraocular lens
SD	Spectral domain
SD-AS-OCT	Segment optical coherence tomography
TD	Time domain
UBM	Ultrasound biomicroscopy
VHFDU	Very high frequency digital ultrasound

INTRODUCTION

The corneal epithelium plays an important role in the optics of the eye. It maintains the corneal integrity and function and influences tear film stability. The alterations of corneal epithelial thickness (CET) are found in many pathological conditions such as contact lens wearing, dry eye and keratoconus. Knowledge of the topographic CET profile and how it can change has been applied in clinical evaluation of various corneal disorders and in refractive surgery. Several imaging modalities, such as high frequency scanning ultrasound bio microscopy, confocal microscopy, and optical coherence tomography (OCT) have facilitated measurement of CET. Spectral domain anterior segment optical coherence tomography (SD-AS-OCT) has been reported as noninvasive, repeatable and reproducible method with higher scanning speed and resolution ***(Samy et al., 2017).***

OCT has been developed for non-invasive cross-sectional imaging in biological systems by using low-coherence interferometry to produce a two-dimensional image of optical scattering from internal tissue microstructures in a way that is analogous to Ultrasonic pulse-echo imaging. Spectral domain (SD), a newer generation OCT, seems to be reliable and reproducible enough to measure corneal epithelial thickness with sufficient axial resolution, in contrast to the measurements with the previous generation instruments based on time domain (TD)OCT ***(Zhou and Stojanovic, 2014).***

AIM OF THE WORK

To study the corneal epithelial thickness in different corneal conditions using anterior segment optical coherence tomography.

Chapter 1

ANATOMY OF CORNEA

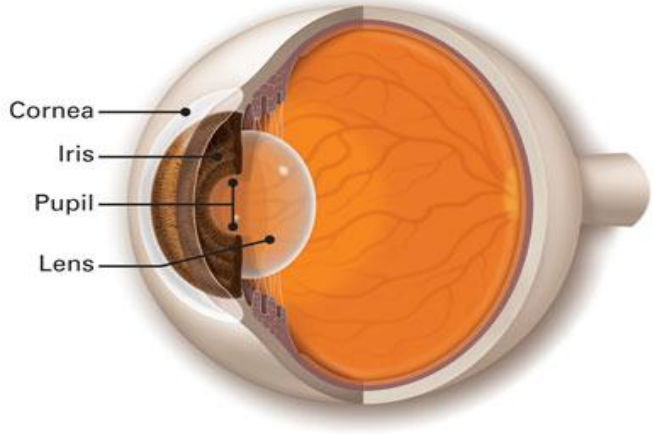

Figure (1): Anatomy of cornea ***(DelMonte and Kim, 2011).***

Gross anatomy

The cornea is a transparent avascular tissue that acts as a structural barrier and protects the eye against infection 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., 2011).***

Cornea 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 cornea is 1.376. There is a gradual increase in thickness from central cornea to the periphery ***(Feizi et al., 2014).***

Microscopic anatomy

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 showen in [Fig. 2]. Recently, a layer of cornea (Dua's layer) which is well defined, acellular in pre-Descemet's cornea is getting attention with the development of lamellar surgeries ***(Dua et al., 2013).***

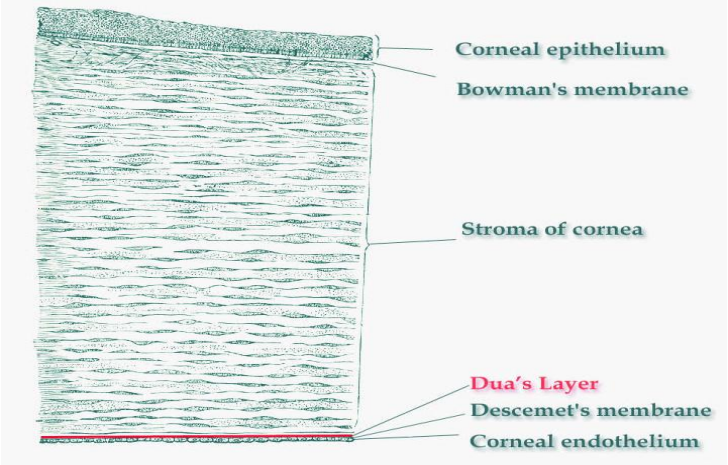

Figure (2): Layers of cornea ***(Dua et al., 2013).***