Evaluation Of Corneal Endothelial Changes Using Specular Microscope Before And After Collagen Cross Linking For The Treatment Of Keratoconus

Thesis

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Abbreviations

BB	:	Big Bubble
BCVA	:	Best Corrected Visual Acuity
HEX	:	Percentage of hexagonality
BM	:	Bowman's Layer
CCT	:	Central Corneal Thickness
CDVA	:	Corrected Distance Visual Acuity
CV	:	Coefficient of Variation
CXL	:	Corneal Cross-Linking
DALK	:	Deep Anterior Lamellar Keratoplasty
DL	:	Dua's Layer (Pre-descment)
ECD	:	Endothelial Cell Density
EDTA	:	Ethylenediamineteraacetic acid
ROS	:	Reactive oxygen species
FACIT	:	Fibril Associated collagens with interrupted triple helics
HSV	:	Herpes simplex virus
KC	:	Keratoconus
logMAR	:	Logarithm of the Minimum Angle of Resolution
LASIK	:	Laser – assisted in situ Keratomiliuses
PMMA	:	Polymethyl Methacrylate
RGP	:	Rigid gas Permeable
SE	:	Spherical Equivalent
UCVA	:	Uncorrected Visual Acuity
UV-A	:	Ultraviolet-A

INTRODUCTION

Keratoconus is a progressive disorder in which the cornea assumes a conical shape secondary to stromal thinning and protrusion. Both eyes are affected at least on topographical imaging, in almost all cases. The hallmark of keratoconus is central or paracentral stromal thinning accompanied by apical protrusion and irregular astigmatism. The disease tends to progress during the adolescent years and into the mid-20s and 30s, although progression can occur at any time.

The etiology of keratoconus is still largely unknown**,** although many biochemical and pathological changes at the structural and cellular level of the corneal abnormalities have been suggested.

Patients with keratoconus often complain of decrease in visual acuity which can be mild or severe depending on the degree of corneal tissue affection. Keratoconus can be classified according to the severity of the clinical and topographic signs into mild, moderate and advanced.

The clinical manifestations of keratoconus include steepening of the cornea, especially inferiorly, thinning of the corneal apex, corneal scarring, Vogt’s striae and Fleischer's ring. In advanced keratoconus, two findings are associated

with keratoconus diagnosis; Munson's sign and corneal hydrops.

Early in the disorder the astigmatism can be corrected by glasses. With the progression of the protrusion, the astigmatism needs hard contact lenses or even keratoplasty in advanced cases.

The keratometer aids in the diagnosis of keratoconus. The initial keratometric sign of keratoconus is absence of parallelism and inclination of the mires. The photo-keratoscope or placido disc can provide an overview of the cornea and can show the relative steepness of any corneal area. The even separation of the rings in the spherical and the astigmatic cornea and the uneven spacing of the rings especially inferiorly in the keratoconic cornea should be noted.

Ultra-sonic Pachymetry is a technique for measuring corneal thickness that aids in diagnosis and evaluation of the stages of keratoconus.

Keratoconus is more accurately distinguished from the normal population by videokeratography. Videokeratoscopy is used clinically to demonstrate the topography changes in keratoconus distinguishing the different stages of keratoconus. Confocal microscopy and specular microscopy allow the visualization of more details in the corneal layers.

AIM OF THE WORK

The purpose of this work is to evaluate the corneal endothelial changes following corneal collagen cross linking (CXL) for the treatment of progressive keratoconus using corneal specular microscopy.

ANATOMY OF THE CORNEA

Anatomy

Cornea is the transparent, anterior one-sixth of the outer coat of the eye-ball, along with the pre-corneal tear film forms the major refracting surface of the eye and serves as a barrier between the environment and the inside of the eye Microscopically the cornea is composed of 6 layers from front to back (Fig.1):

1- Epithelium.

2- Bowman's layer.

3- Stroma.

4- Dua's layer (pre-descment).

5- Descemet's membrane.

6- Endothelium

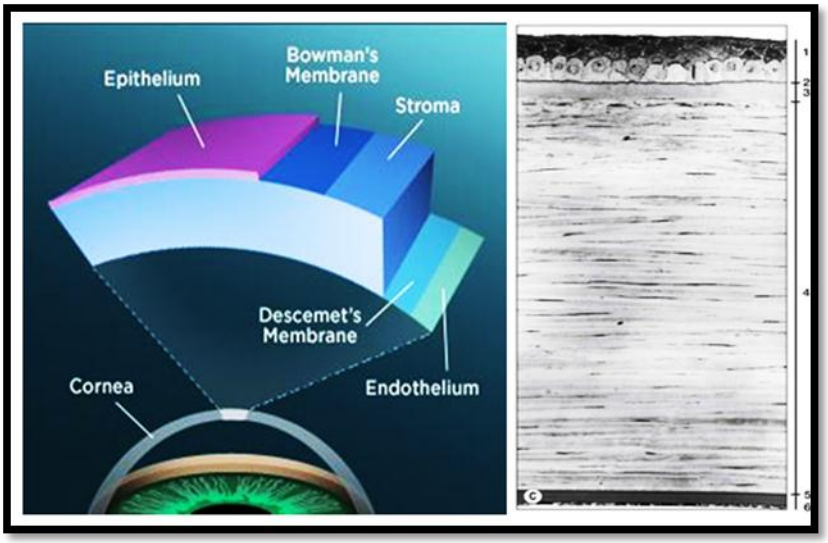

Fig. (1): Microscopic appearance of cornea layers ***(Snel et al., 1998)***

The cornea (figure. 1) consists of the 50 μm thick epithelium, the 450-500 μm thick stroma and the endothelium. The epithelium and the stroma are divided by the epithelial basement membrane and the 8-10 μm thick Bowman's layer posterior to the BM. ***(Merindano, et al., 2002)*** Furthermore, between the stroma and the endothelium is the Descement's membrane. On average, the cornea is thinner centrally (500-550 μm) than peripherally (600-700 μm) ***(Hjortdal et al., 2005).***

The cornea is one of the most densely innervated organs of the human body. Nerve injury delays or even arrests corneal wound healing, which may lead to formation of optical aberrations related to corneal irregularities, corneal ulcers and even perforations. Diseases and surgical operations can lead to permanent and/or long standing neuronal injuries. The correlation between nerve loss and cellular alterations remains unknown ***(Muller et al., 2003).***

Epithelium:

It is composed of non keratinized, non secretory, stratified squamous epithelium (Fig. 2) which is 4–6 cell layers thick (40–50 μm). The epithelium is covered with a tear film of 7 μm thickness, which is optically important in smoothing out microirregularities of the anterior epithelial surface. The tear-air interface, together with the underlying