Recent advances in prophylaxis and management of corneal ectasia afterLaser In Situ Keratomileusis

Essay

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By

John KeddisShehata

(M.B.B.CH)

Under supervision of

Prof. Dr: FatmaShafik El Hennawi
Professor of ophthalmology
Faculty of medicine
Ain shams university

DR: Al−Hussein Ali Swelem
Lecturer of ophthalmology
Faculty of medicine
Ain Shams university

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content

LIST OF ABBREVIATIONS

ABT	**Asymmetric Bowtie**
BMP	**Bone morphogenic proteins**
BSF CCT	**Best Sphere Fit Central corneal thickness**
CH	**Corneal Hysteresis**
CRF	**Corneal Resistance Factor**
CT	**Preoperative Corneal Thickness**
CXL	**Collagen cross-linking**
DALK	**deep anterior lamellar keratoplasty**
D	**Diopters**
DSPG	**dermatan-sulfate proteoglycan**
ECM	**Extracellular matrix**
EGF	**Epidermal growth factor**
FFK	**Forme Fruste Keratoconus**
IL-1 IE	**Interleukin 1 Itrogenic ectasia**
IOP IOPCC	**Intraocular pressures Corneal-compensated**
IOPG	**IOP Goldmann-correlated IOP**
IS	**Inferior steepening**
KSPG	**keratan-sulfate proteoglycan**
LASIK	**Laser in situ keratomileusis**
MMPs	**Matrix metalloproteinase's**
µm	**Micrometer**
MRSE	**Spherical equivalent manifest refraction**
OCT	**Optical coherence tomography**
OLCR	**Optical Low Coherence Reflectometry**
ORA	**Ocular Response Analyzer**
PDGF	**Platelet derived growth factor**
PKP	**penetrating keratoplasty**
PMD	**Pellucid marginal degeneration**
PRK	**Photorefractive Keratectomy**
RST	**Residual stromal thickness**

TNF	**Tumor necrosis factor**
SBT	**Symmetric Bowtie**
SRA	**Skewed Radial Axis**
US	**Ultrasound**
VHF	**Very high frequency**
WA	**waveform analysis**

LIST OF FIGURES

Chapter 1- Biomechanical and biological responses to LASIK.

Chapter 2- prophylaxis of post LASIK ectasia

LIST OF TABLES

Introduction

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Post-LASIK Ectasia can be defined as a Progressive non inflammatory corneal thinning after surgery resulting in irregular topographic steepening and the resultant irregular astigmatism.And associated with inferior topographic steepening of 5 diopters (D) or greater compared with immediate postoperative appearance.

Post LASIK ectasia is associated with a loss of 2 or more Snellen lines of uncorrected visual acuity. And a change in manifest refraction of 2 D or more in either sphere or cylinder.The incidence of ectasia after refractive surgery is not known precisely, but have been estimated to be 0.2% to 0.66% in recent studies.

Aim of the Study

The aim of this work is to review the most recent strategies for prophylaxis and management of corneal ectasia after keratorefractive surgery.

BIOMECHANICAL AND BIOLOGICAL ASPECTS OF THE CORNEA IN RESPONSE TO LASIK

I. Corneal Biomechanics

Foundations of the biomechanical response:

1. Cornea Anatomy and Structure

The cornea is the transparent anterior portion of the eye through which the iris and pupil can be visualized. The transparency and curvature of the cornea are essential to good vision. The cornea and lens make up the refractive elements of the eye, with the cornea providing approximately 3/4 of its refractive power (≈45 D). The cornea is thickest at the limbus (0.6–0.8 mm) and thins centrally (0.5–0.6 mm), with an aspheric curvature. The hydrated cornea is composed of ≈ 80% water. A hydrophilic proteoglycan extracellular matrix maintains corneal hydration by drawing water into the cornea from the tear film anteriorly and the aqueous posteriorly through a fluid pump mechanism. (***DelMonte et al 2011)***

The cornea is made up of five layers **(fig 1)** and is mainly composed of collagen. Listed from anterior to posterior, the layers are: Epithelium, Bowman's membrane, stroma, Descemet's membrane, and endothelium. The epithelial layer is very thin, with a basement membrane composed of type-IV collagen, and contributes little to the overall strength and curvature of the cornea. Bowman's layer is a thin (8–12 μm), tough layer of irregularly arranged type V collagen fibers that protects the stroma. The corneal stroma makes up approximately 90% of the corneal thickness

and is composed of highly organized collagen fibrils (type I > type III, type V) with their orientation maintained by a proteoglycan matrix. Collagen fibrils are organized into bundles called lamellae which vary in number across the cornea from 300 centrally to 500 at the limbus. The anterior lamellae of the stroma take random courses from the limbus, often interweaving with and terminating in the collagen of Bowman's membrane. Posterior lamellae have a more ordered organization, running from limbus-to-limbus along the superior-inferior or nasal-temporal meridians. At the limbus, stromal and scleral collagen interweave in a circumferential manner, which accounts for an increase in corneal thickness in this region. Descemet's membrane is composed of type IV collagen and is flexible and extensible, preventing the transmission of stromal stress to the endothelium. (***DelMonte et al 2011)***

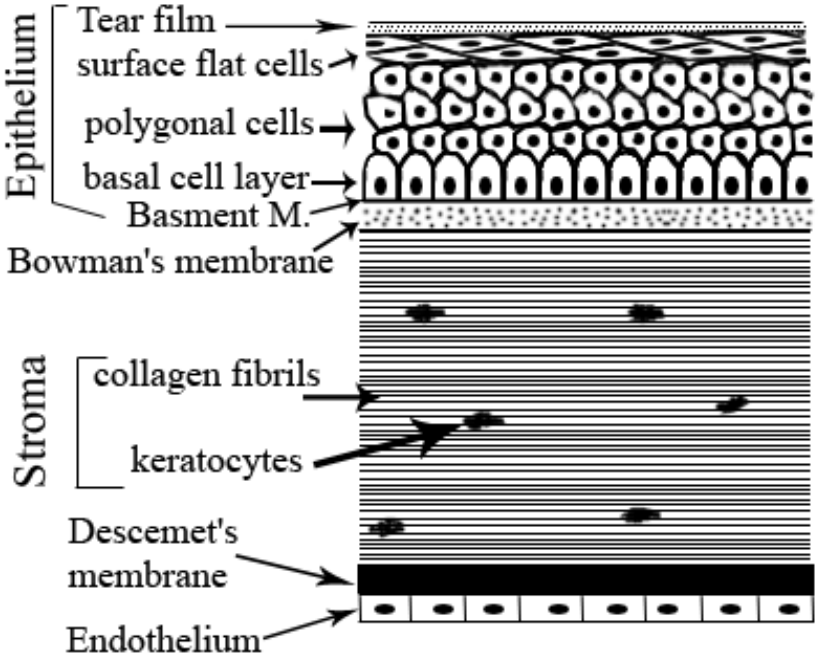

Fig 1 Diagram illustrating layers of the cornea. **(*DelMonte et al 2011)***