

بسم الله الرحمن الرحيم





شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم



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





بعض الوثائق الأصلية تالفة





بالرسالة صفحات لم ترد بالأصل



Assessment of the eye for further surgery after LASIK

Essay

Submitted for Partial Fulfillment of the Requirement of
Master Degree in Ophthalmology

By

Rasha Hassan Abdu Ismail

“M.B.B.Ch”

Alexandria University

Supervisors

Ali Hassan Saad, MD

Professor of Ophthalmology

Ain Shams University

***Hisham Mohamed Khairry Abdel
Daym, MD***

Assistant Professor of Ophthalmology

Ain Shams University

Faculty of medicine

Ain Shams University

2008

A decorative border with intricate floral and vine patterns in green, gold, and red, framing the central text.

بسم الله الرحمن الرحيم

(قالوا سبحانك لا علم لنا
إلا ما علمتنا إنك أنت
العليم الحكيم)

صدق الله العظيم



Acknowledgement

First of all, my thanks and all gratitude to *Allah*, whose help I always seek and without his willing this work would not have been possible.

I would like to express my deep appreciation and gratitude to *Prof. Dr. Ali Hassan Saad*, Professor of Ophthalmology, Ain Shams University, for his generous guidance, continuous support and for his valuable advice in planning this study. It has been a great honor to work under his supervision.

I also feel deeply grateful to *Ass. Prof. Dr. Hisham Khairy Abdel Daym*, Assisstant Professor of Ophthalmology, Ain Shams University, for his cooperation and support throughout this work.

Finally, I'd like to thank my colleagues and friends for their help. And much gratitude to my husband and kids, they ,, were an inspiration and motive to finish this work.





Table of Contents

<i>List of Abbreviations.....</i>
<i>List of Figures.....</i>
<i>Introduction.....</i>	1-3
<i>Refractive Surgery</i>	4-24
§ History of Refractive Surgery.....	4-6
§ Surgical Procedures.....	6-17
LASIK Procedure.....	6
Surface Ablation....	10
§ Complications.....	17-22
§ Factors Affecting Surgery.....	22-23
§ Conclusions And Future Directions.....	23-24
<i>Corneal Recovery After LASIK</i>	25-43
§ Anatomy Of The Cornea.....	25-33
Tear film.....	25
Corneal structure.....	26
Corneal innervation.....	30
§ Corneal Imaging By In Vivo Confocal Microscopy.	33-38
§ Corneal Recovery After Refractive Surgery.....	38-42
Wound healing after lasik.....	39
§ Nerve Regeneration After Refractive Surgery.....	42-43
<i>IOL Calculation After LASIK.....</i>	44-62
§ Reasons Of Miscalculation Of IOL After LASIK...	44
§ Currently Available Methods To Calculate IOL	
After LASIK&PRK.....	45
-Methods Requiring Preop Keratometry , Preop	
Refraction, And Postop Refraction.....	48
- Methods Requiring Only Preop Keratometry.....	50
- Methods Requiring Only Preop Refraction.....	51
-Methods That Don't Require Preop Data.....	56
§ Numerical ray tracing	61

<i>IOP Measurement After LASIK.....</i>	<i>62-72</i>
§ The Correlation Between IOP Measurement Central Corneal Thickness&Corneal Curvature.....	62
§ Intraocular Pressure Measurements Using Dynamic Contour Tonometry after LASIK.....	64
§ Ocular Response Analyzer versus Goldmann Applanation Tonometer.....	68
<i>Evaluation Of RNFL After LASIK.....</i>	<i>73-79</i>
§ Anatomy Of The Retina	75
§ Evaluation of RNFL by Scanning laser polarimetry.....	75-79
<i>Summary.....</i>	<i>80-81</i>
<i>References.....</i>	<i>82-107</i>
<i>Arabic Summary.....</i>	<i>108</i>

List of Figures

1	Fig. 1	Creation of the flap of LASIK procedure
2	Fig. 2	The cornea is reshaped with excimer laser
3	Fig. 3	Flap returned to its original position
4	Fig. 4	Photo Refractive Keratectomy
5	Fig. 5	Epikeratome lifts the epithelium
6	Fig. 6	Epithelium completely separated
7	Fig. 7	Cornea reshaped with excimer laser
8	Fig. 8	New epithelial layer grows over treated area
9	Fig. 9	Epi-LASIK versus LASIK
10	Fig. 10	Corneal structure
11	Fig. 11	Corneal nerves
12	Fig. 12	Normal CMTF intensity profile of the cornea
13	Fig. 13	IvCM of the cornea
14	Fig. 14	Retinal anatomy

List of Abbreviations

APC	Antigen presenting cells
BM	Epithelial basement membrane
CCT	Central corneal thickness
CMTF	A confocal microscopy through focusing
D	Diopter
DCT	Dynamic contour tonometer
DLK	Diffuse Lamellar Keratitis
EGF	Epidermal growth factor
GAT	Goldmann applanation tonometry
GDx	scanning laser polarimeter
HGF	Hepatocyte growth factor
INF	Average thickness of the inferior 120° of the calculation circle
IvCM	In vivo confocal microscopy
IOL	Intra ocular lens
IOP	Intra ocular pressure
LASEK	Laser Assisted Sub-Epithelial Keratectomy
LASIK	Laser assisted in situ keratomileusis
NFI	It is a global measure based on the entire RNFL thickness map calculating using an advanced form of neural network to discriminate normal from glaucoma
ORA	Ocular Response Analyzer

PRK	Photo refractive keratectomy
RNFL	Retinal nerve fibre layer thickness
SD	This measure represents the standard deviation of the values contained in the calculation circle
SLP	Scanning laser polarimetry
SUP	The average RNFL thickness in the superior 120° of the calculation circle
TGF-α	Transforming growth factor
TSCM	Tandem scanning confocal microscope
TSNIT	The average RNFL thickness around the calculation circle
VCC	Variable corneal polarisation compensator



Introduction:

LASIK is close to *Barraquer's* invention of the early *1950s*, where a corneal button was frozen and modified after removal with a microkeratome. In LASIK, a mechanical microkeratome, or more recently a femtosecond laser, creates a corneal flap of 100-200 μm in the anterior part of the stroma and epithelium. The microkeratome has an oscillating blade to cut the flap after the immobilisation of the cornea with a suction ring. A narrow portion of the stroma, either at a superior or nasal position, is left undetached and serves as a hinge for the flap, which is then folded aside. A laser ablation is then performed on the mid-stroma. After the laser ablation the stromal bed is irrigated and the corneal flap repositioned. Recently, flaps have been created with femtosecond lasers, but the acclaimed higher accuracy of this method is still controversial compared to newer mechanical microkeratomes.⁽¹⁾

LASIK results in faster improvement of uncorrected visual acuity, and has significantly less postoperative discomfort than in surface ablation. As there is no epithelial-stromal interaction, except at the flap margin, haze is minimal after LASIK. This enables deeper ablations and thus corrections for higher myopic errors compared to PRK. However, deeper ablation results in a thinner corneal bed, which puts the maintenance of corneal curvature at risk.⁽²⁾ There is a consensus regarding a sufficient stromal bed thickness of 250 μm , but many ophthalmic surgeons prefer a more conservative value of 300 μm so as to avoid keratectasia. Furthermore, the suction ring induces an increase of intraocular pressure to over 100 mmHg, usually for 15 to 45 seconds. Such an elevated IOP poses a potential risk for occlusion in blood flow and thus hypoxemia in the macular region.



Longterm Followup studies after LASIK have shown that this procedure is safe and predictable.^(3,4) It seems that over the longterm the results of PRK and LASIK are very similar .

Cornea, as the basic optical lens of the eye, is the main element to be influenced during various, and first of all laser, surgeries with refractive, reconstructive, optical and other purposes.

An unfortunate consequence of corneal refractive surgery is difficulty in accurately calculating intraocular lens (IOL) power in eyes undergoing cataract surgery.^(5,6,7)

Cornea, such as thickness changes, regenerative response of corneal tissue and its regulation after (LASIK) results in low inaccurate intraocular pressure (IOP) readings.^(8,9)

LASIK induces a shift in corneal polarization axis which is responsible for inaccuracies in RNFL (retinal nerve fibre layer) thickness measurements. A customized compensation for corneal polarimetric changes after LASIK allows normalization of some of the thickness parameters except for the average RNFL thickness around the calculation circle TSNIT (the average RNFL thickness around the calculation circle average) and NFI (it is a global measure based on the entire RNFL thickness map calculating using an advanced form of neural network to discriminate normal from glaucoma patients) .⁽¹⁰⁾