

شبكة المعلومات الجامعية







شبكة المعلومات الجامعية التوثيق الالكتروني والميكروفيلم



شبكة المعلومات الجامعية

### جامعة عين شمس

التوثيق الالكتروني والميكروفيلم

#### قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها على هذه الأفلام قد أعدت دون أية تغيرات



يجب أن

تحفظ هذه الأفلام بعيدا عن الغبار في درجة حرارة من ١٥-٥٠ مئوية ورطوبة نسبية من ٢٠-٠٠% To be Kept away from Dust in Dry Cool place of 15-25- c and relative humidity 20-40%



# بعض الوثائـــق الإصليــة تالفــة



# بالرسالة صفحات لم ترد بالإصل

## CORNEAL ENDOTHELIAL PROTECTION BY DIFFERENT VISCOELASTICS DURING PHACOEMULSIFICATION

B 5616

Essay
Submitted for partial fulfillment of
M.Sc. in ophthalmology

#### By

YASER ABDEL MAGEED MOHAMED EL TAHER (M.B, B.Ch)

#### Supervised by

Professor of Ophthalmology - Faculty of medicine

on Samuaa Ain Shams University

DR. ABDALAH KAMEL HASSOUNA

Assistant professor of Ophthalmology - Faculty of medicine

Ain Shams University

Faculty of Medicine

Ain Shams University

Cairo



#### **ACKNOWLEDGEMENT**

I would like to express my deepest gratitude and appreciation to *Prof. Dr. Hassan El Sammaa*, professor of ophthalmology Ain Shams University for his closet observation and sincere remarks that helped me during my preparation for this essay.

I would like to thank *Dr. Abdallah Hassouna*, Assistant Professor of ophthalmology Ain Shams University for his moral support and continuous guidance throughout this work.

Special thanks to *Dr. Mona El Fikky*, Lecture of ophthalmology Ain Shams University, *Ahmed Abdel Mageed*, *Islam Hamdy*, Assistant Lectures of ophthalmology Ain Shams University for their great aid and providing me with valuable papers which facilitate production of this study.

Last but not least, I thank all my family for their continuous encouragement and valuable support, without them, this work wouldn't have been possible.

Above all thanks to God.

#### List of Contents

	Page
Anatomy	1
Physiology	8
Methods of examination of the corneal endothelium	16
Operative factors associated with corneal injury during phaco	27
Introduction to viscoelastics	37
Physical and chemical properties	51
Classification of viscoelastics	62
Evaluation of different viscoelastics and air bubble during phacoemulsification	84
Summary	93
References	97
Archic Summany	

#### List of Figures

	Page
Figure (1): Three-dimentional diagram of endothelial cell	2
Figure (2): Waves of migration of neuroectodermal cell	3
Figure (3): Metabolic pump with different ion transporter channels and their directions	11
Figure (4): Pleomorphism: wide field specular microscope photograph	14
Figure (5): Polymegathism: wide field specular microscope photograph	15
Figure (6): Zones of specular reflection	21
Figure (7): Optical principle of the scanning mirror specular microscope	23
Figure (8): Optical principle of confocal microscope	25
Figure (9): Tomey confoscan machine	25
Figure (10): Peristaltic pump	29
Figure (11) Venturi pump	30
Figure (12): Diaphragm pump	31
Figure (13): Mechanism of surge	32
Figure (14): Vacuum surge suppressor	33
Figure (15): Scanning electron micrograph of IOL that has touched the corneal endothelium	38

	Scanning electron micrograph of human corneal endothelium following touch of IOL	39	
Figure (17): 7	Thick cannula is needed for cohesive VES	43	
Figure (18):	Thin cannula is needed for dispersive VES	43	
Figure (19): (	Cohesive VES act as a cushion against forward vitreous pressure	43	
Figure (20): §	Stretching of viscoelastic molecular chain with different shear rate	46	_
Figure (21): H	Entangling of cohesive VES in one mass	47	
	Entangling of cohesive VES with high molecular weight	48	
Figure (23):	Effective wetting agent for PMMMA IOL	49	
Figure (24):	Molecular structure of sodium hyaluronate	52	
Figure (25): 1	Molecular structure of HPMC	55	
Figure (26): 1	Molecular structure of CDS	57	
Figure (27): 1	Molecule of Healon GV	63,	
Figure (28): I	Long molecules of cohesive VES	63	
• • •	Coating of corneal endothelium with Amivisc plus	64	
Figure (30): 1	Healon GV with long molecular weight	65	ŕ
Figure (31): 5	Short molecules of dispersive VES	66	
Figure (32): \$	Short molecules of dispersive VES	66	
Figure (33): S	Short molecules of dispersive VES	66	

Figure (34): High molecular weight of Healon5	68
Figure (35): Healon5 act as a cohesive VES in slow-moderate drag	69
Figure (36): Healon5 act as a dispersive VES in fast drag	69 <sup>.</sup>
Figure (37): Fracture of tiny piece of Healon5 close to phaco tip	70
Figure (38): Clarity of Healon5 under microscope	71
Figure (39): Arshinoff soft shell techniques	72
Figure (40): Arshinoff soft shell techniques	72
Figure (41): Arshinoff soft shell techniques	72
Figure (42): Arshinoff soft shell techniques	72
Figure (43): Arshinoff soft shell techniques	73
Figure (44): Arshinoff soft shell techniques	73
Figure (45): Arshinoff soft shell techniques	73
. Figure (46): Methods of removal of VES	78
Figure (47): Cohesive VES and capsulorrhexis	80
Figure (48): Compression and drag forces	81
Figure (49): H&E of corneal endothelium preop and postop	84
Figure (50): H&E of superior and inferior aspect of the cornea of the operated eye	84
Figure (51): Preop and postop specular photograph of corneal endothelium	85
Figure (52): Photomicrograph showing area of undamaged and extensive damage corneal endothelium	86
Figure (53): Scanning electron micrograph showing islands of undamaged and damaged cells	86

,

.

.'	
Figure (54) Photomicrograph of undamaged endothelium from an eye in which air bubbles infused in AC filled with Viscoat	89
Figure (55): shows staining of the cells for F-actin	90
Figure (56): Ring of damage of endothelium after air bubbles injection	92

.

.

.