EVALUATION OF TRANSVERSAL VERSUS TORSIONAL ULTRASOUND MODALITIES IN PHACOEMULSIFICATION

Thesis

Submitted for Partial Fulfillment of MD Degree In
Ophthalmology

By

Mohamed Ibrahim Saleh Mohamed
M.B.,B.Ch, M.Sc., Ain Shams University

Under supervision of

Prof. Dr. ISMAIL I. HAMZA
Professor of Ophthalmology
Faculty of Medicine, Ain Shams University

Prof. Dr. MOHAMMAD AHMAD RASHAD
Professor of Ophthalmology
Faculty of Medicine, Ain Shams University

Ass. Prof. Dr. MONA MOHAMED EL-FIKY
Assistant Professor of Ophthalmology
Faculty of Medicine, Ain Shams University

Faculty of Medicine – Ain Shams University
Cairo- Egypt
2015

تقييم الموجات فوق الصوتية ذات الحركة المستعرضَة مقابل الإلتوائية المستخدَمة في تفتيت العدسة

رسالة مقدمة من

الطبيب/ **محمد إبراهيم صالح محمد**

ماجستير طب و جراحة العيون - جامعة عين شمس

تمهيدا للحصول على درجة الدكتوراة في طب و جراحة العيون

تحت إشراف

أ.د./ اسماعيل إبراهيم حمزة

أستاذ طب و جراحة العيون

كلية الطب - جامعة عين شمس

أ.د./ محمد أحمد رشاد

أستاذ طب و جراحة العيون

كلية الطب - جامعة عين شمس

أ.م.د./ منى محمد الفقي

أستاذ مساعدطب و جراحة العيون

كلية الطب - جامعة عين شمس

كلية الطب – جامعة عين شمس

القاهرة- مصر

٢٠١٥

ACKNOWLEDGMENT

I would like to express my deepest gratitude and thanks to **Prof. Dr. Ismail I. Hamza,** Professor of Ophthalmology, Faculty of Medicine, Ain Shams University, for his close observation and valuable remarks which provided me with the best guide and mentor, in both my thesis and my life.

I am indebted to **Prof. Dr. Mohammad Ahmad Rashad,** professor of Ophthalmology, Faculty of Medicine, Ain Shams University, for his supervision and help in this work.

I would also like to thank **A. Prof. Dr. Mona El-Fiky**, assistant professor of Ophthalmology, Ain Shams university, for her great support and effort during the preparation and revision of the whole work.

Special thanks to my wife, my family and my colleagues for their help and support in this work.

CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBEREVIATIONS

CCT: central corneal thickness

CDE: cumulative dissipated energy

CV: coefficient of variation

ECC: Endothelial cell count

ECL: endothelial cell loss

EFX: effective phaco time for Ellips Fx

e.g.: for example

HEX: hexagonality

IP: intelligent phaco

LOCS: lens opacities classification system

PO: postoperative

SD: standard deviation

SPSS: statistical package for social sciences

US**:** ultrasound

UST: ultrasound time

Introduction

Phacoemulsification has gained acceptance as the standard technique for cataract surgery worldwide. It utilizes ultrasonic energy to break up and remove a cataractous lens. More ultrasonic energy and time are needed for hard nucleus removal than for softer ones, thus increasing the risk of surgical induced trauma, especially corneal endothelial dysfunction. (1)

Recent developments in phacoemulsification have made cataract removal safer and more efficient. Advances in power modalities have provided more options, allowing surgeons to customize their techniques, to reduce phaco energy and duration. (2)

The torsional phaco (OZil®) used in Infiniti® phacoemulsification machine is a hardware and software upgrade which includes a dedicated handpiece that produces side-to-side oscillations of the phaco-tip. Comparing with the jackhammer motion in conventional longitudinal phaco, the improved OZil® torsional oscillation sheers the lens material with virtually no

repulsion, thereby dramatically reduced phaco energy required for lens removal without compromising efficiency. Furthermore, torsional phacoemulsification emulsifies in both to and fro directions and thereby does not waste energy. [3; 4]

However; with torsional movement alone, the tip may get clogged with denser nuclei. That is why "Intelligent Phaco" (OZil IP®) was invented. When OZil IP® detects occlusion at a maximum vacuum setting, it delivers few milliseconds of longitudinal phaco relative in amount to the torsional amplitude, releasing the occlusion, restoring the aspiration and flow, and keeping the lens material at the best shearing plane without inducing repulsion. [5; 6]

The latest innovation in this field was the new transversal ultrasound incorporated in the Ellips FX technology. Unlike the OZil technology in which the phaco-tip can only oscillate either torsionally or longitudinally or alternates between both, the Ellips FX technology blends both transversal and longitudinal movement at the same time creating an elliptical stroke