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ملاحظات:
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Correlation between keratometric measurements obtained by the VERION Image Guided System, optical biometry (IOLMaster) and corneal topography in Egyptian cataractous patients

Thesis

Submitted for Partial Fulfillment of Master Degree in Ophthalmology

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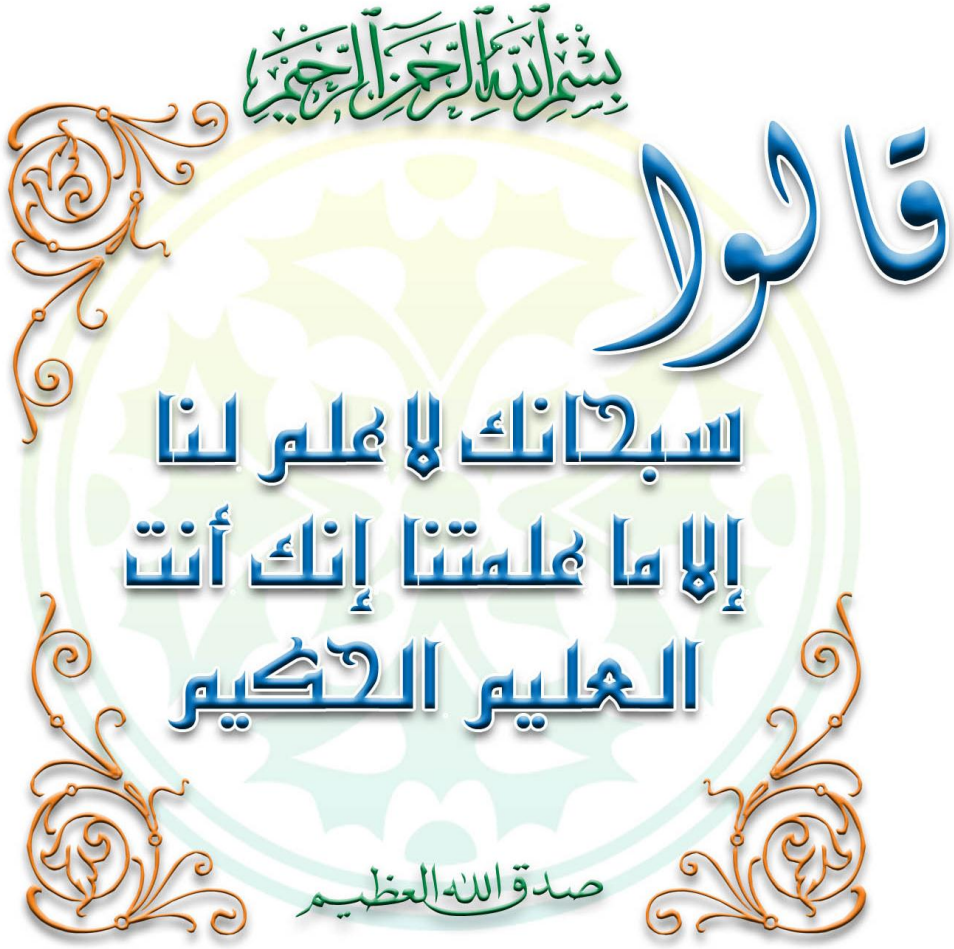

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Aya Sayed

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List of Abbreviations

Abb.	Full term
ACD	Anterior chamber depth
AKR	Automated keratorefractometer
AST	Astigmatism
CCT	Central corneal thickness
CFs	Collagen fibrils
IHA	Index of height asymmetry
IHD	Index of height decentration
IOL	Intraocular lens
IVA	Index of vertical asymmetry
K1	Flat k
K2	Steep k
Km	K mean
OCT	Optical coherence tomography
PGs	Proteoglycans
SM	Specular microscope

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INTRODUCTION

The prevalence of astigmatism increases with age, with most of studies reporting that approximately 30% of patients undergoing cataract surgery present more than 1.5 D of preexisting corneal astigmatism ***(Vale et al., 2016).***

This astigmatism must be corrected to achieve a real spectacle independence after cataract surgery, with the presence of a minimal postoperative refractive error. It should be considered that currently patients undergoing cataract surgery are more demanding ***(Alio et al., 2014).***

For this reason, sophisticated intra ocular lens (IOL) designs are being developed in the last years to provide a correction of not only spherical but also astigmatic refractive errors, which are the toric IOLs. The selection of the cylindrical power of toric IOLs is based on the measurement of corneal astigmatism which should be very accurate to avoid inadequate IOL power calculations. Currently, there are many devices providing measurements of corneal curvature and astigmatism that can be used for toric IOL power calculation ***(Piñero et al., 2015)***.

Recently, the cataract surgery has evolved to a refractive surgery in a way that surgeons can customize the refractive

outcome in every case, but surgical planning has also become a great challenge to meet patients' visual expectations ***(Hayashi et al., 2000).***

Increased patient expectations can only be met with an excellent refractive outcome. The final refractive outcome mostly depends on accurate clinical measurements of corneal power, anterior chamber depth, axial length, and intraocular lens (IOL) power calculations. Correct measurement of corneal astigmatism and axis location is a key to astigmatism correction during cataract surgery by either toric intraocular lenses or astigmatic keratotomies ***(Chen et al., 2011).***

Nowadays, these values can be measured using different devices. The IOLMaster (Carl Zeiss Meditec, Germany) has become the gold standard to achieve all these calculations by setting non-contact biometry with lower indentation and infection risk ***(Goebels et al., 2015).***

A new system arrived on the market and intended to provide a complete preoperative and postoperative assessment called the "VERION Image Guided System" (Alcon Laboratories Inc., Fort Worth, TX). With this new system, a question is raised according to the reproducibility of its keratometric measurements and the differences in the data obtained by this new system and the standard ones ***(Mueller et al., 2016).***

VERION Image Guided system captures and utilizes a high-resolution reference image of a patient's eye to determine the radii and corneal curvature of steep and flat axes, Limbal position and diameter, pupil position and diameter, and corneal reflex position.

Besides, it provides intraoperative surgical planning functions that utilize the reference image and intraoperative measurements to assist with planning cataract surgical procedures, including the number and location of incisions and the appropriate IOL using existing formulas. It links to compatible surgical microscopes to display concurrently the reference and microscope images, allowing the surgeon to account for lateral and rotational eye movements.

In addition, the planned capsulorhexis position and radius, IOL positioning, and implantation axis can be overlaid on a computer screen or the physician's microscope view at the time of surgery. This suite may be especially useful in cases where the implantation of a toric IOL is being planned ***(Nemeth et al., 2015).***

In a prospective clinical trial, the right eyes of 52 patients with cataract were examined. Flat K readings of VERION were higher than IOLMaster. Steep K readings were different for all

two. There were excellent correlations between the VERION and IOLMaster for K1, K2, and Km values ***(Leyla et al., 2016).***

AIM OF THE WORK

To measure the correlation coefficient for the keratometric measurements of VERION Image Guided System, an optical biometry (IOLMaster) and corneal topography in Egyptian cataractous patients.

Chapter 1

CORNEAL ANATOMY

The transparent cornea forms the anterior portion of the outer coat of the eye and has the dual functions of protecting the inner contents of the eye as well as providing about two thirds of the eye's refractive power ***(Potvin and Davison, 2015).***

Macroscopic Structure:

Macroscopically the cornea is aspheric in shape with wide variety of ocular dimensions exist in the normal population. The radius of curvature of its central anterior surface is about 7.8 mm. The central corneal thickness (CCT) is approximately 520 μm and increases towards the periphery where it can reach 650 μm ***(Santodomingo-Rubido et al., 2002).***

Microscopic Structure and Composition:

From front to back the cornea consists of five layers, the corneal epithelium, Bowman's layer, the corneal stroma, Descemet's membrane and the corneal endothelium ***(Symes and Ursell, 2011)*** (Figure 1).