بسم الله الرحمن الرحيم

MONA MAGHRABY

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

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جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

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MONA MAGHRABY

Effect of intracorneal ring segments on posterior corneal tomography in eyes with keratoconus

Thesis

Submitted for partial fulfillment of M. D Degree in Ophthalmology

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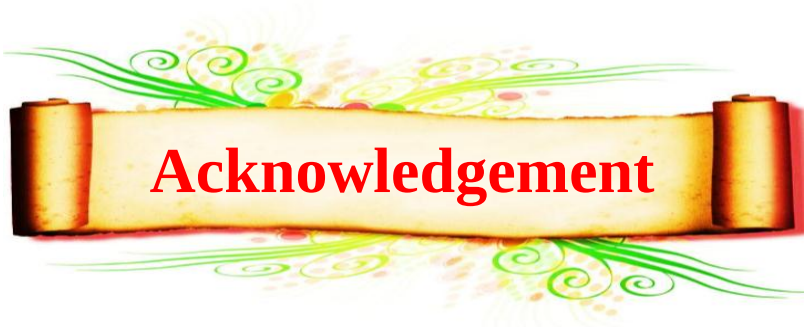

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Contents

List of Abbreviations

Abb.	:	Full term
ACA	:	Anterior corneal astigmatism
Ant Q	:	Anterior Q value
AS-OCT	:	Anterior segment optical coherence tomography
ATR	:	Against-the-rule
BCVA	:	Best corrected visual acuity
CCT	:	Central corneal thickness
CH	:	Corneal hysteresis
CRF	:	Corneal resistance factor
CXL	:	Corneal collagen cross-linking
Cyl Back	:	Topographic cylinder of the back surface
Cyl Front	:	Topographic cylinder of the front surface
D	:	Diopter
DOCK9	:	Dedicator of cytokinesis 9
FS	:	Femtosecond
ICRS	:	Intracorneal ring segments
IOL	:	Intraocular lens
K	:	Keratometry
K max	:	Maximum keratometry
logMAR	:	Logarithm of minimum angle of resolution
ORA	:	Ocular response analyzer
PCA	:	Posterior corneal astigmatism
PMMA	:	Polymethyl methacrylate
Post Q	:	Posterior Q value
PRK	:	Photorefractive keratectomy
Q value	:	Corneal asphericity coefficient
SD	:	Standard deviation
SE	:	Spherical equivalent
SPSS	:	Statistical Product and Service Solutions
TCA	:	Total corneal astigmatism
TGFβI	:	Transforming growth factor beta-induced
UCVA	:	Uncorrected visual acuity

Abb.	:	Full term
VSX1	:	Visual system homeobox 1
WTR	:	With-the-rule
z-anterior	:	The distance between the center of the cornea and the maximum point of anterior elevations
z-posterior	:	The distance between the center of the cornea and the maximum point of posterior elevations

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INTRODUCTION

Keratoconus is a bilateral progressive ectatic corneal disease that leads to paracentral thinning and protrusion of the cornea, eventually assuming a conical shape. This leads to visual impairment due to progressive myopia and irregular astigmatism ***(Romero-Jimenez et al., 2010).***

Keratoconus is classified into 4 stages according to Amsler-Krumeich classification, based on astigmatism, myopia, keratometry, corneal transparency, and pachymetry ***(Krumeich et al., 2009).***

Changes in the posterior corneal surface are an early indicator of ectatic changes in keratoconus. They often precede changes on the anterior corneal surface, and sometimes they could be the only evidence of early keratoconus. Placido disc based corneal topography only detects changes in the anterior corneal surface. The development of Scheimpflug imaging devices allowed the imaging of the posterior corneal surface and highlighted its significance in diagnosis of keratoconus ***(Ambrósio et al., 2011).***

Posterior corneal astigmatism has been long overlooked because of the minimum difference in refractive index between the cornea and the aqueous ***(Belin et al., 2013).***

However, several studies reveal that the posterior corneal astigmatism has higher magnitude in keratoconus eyes compared to normal eyes and demonstrate a significant influence of posterior astigmatism on the total corneal astigmatism. The magnitude of posterior astigmatism tends to increase with increasing keratoconus severity. This means that the effect of posterior astigmatism on visual performance of patients is not necessarily negligible. It is a factor that should be considered when correcting vision in keratoconus patients by spectacles, rigid contact lenses, or toric intraocular lenses ***(Kamiya et al., 2015; Savini et al., 2016).***

Intracorneal ring segments (ICRS) is a commonly used method for treatment of keratoconus. They aim to induce peripheral steeping and therefore central flattening of the anterior corneal surface. This helps to regularize the corneal surface. ICRS were shown to be effective in reducing irregular astigmatism and improving both uncorrected and best corrected visual acuity in keratoconus patients ***(Alió et al., 2006).***

However, there remains some controversy regarding the predictability of the visual outcome after ICRS implantation, with some eyes showing limited improvement and sometimes loss of best corrected visual acuity after surgery ***(Vega-Estrada et al., 2013).***

Although many studies have shown the effect of ICRS on the anterior corneal surface, only a few studies focus on the changes in the posterior surface. There is also some controversy about these changes, with some studies demonstrating a flattening effect of ICRS on the posterior surface ***(Söğütlü et al., 2012),*** while other studies show that the posterior surface becomes steeper after ICRS implantation ***(Rho et al., 2013; Muftuoglu et al., 2017).***

The disparity between anterior and posterior surface changes may be explained by a different biomechanical response of the anterior and posterior surfaces to ICRS implantation. The change in posterior surface may explain, at least in some part, why visual acuity may be unpredictable and is sometimes hard to improve with spectacles or rigid contact lenses after ICRS implantation ***(Muftuoglu et al., 2017).***

The aim of our study is to demonstrate the effect of ICRS on the posterior corneal surface in keratoconus patients and correlate it with the visual outcome.

AIM OF THE WORK

To evaluate the effect of intracorneal ring segments on the posterior corneal surface and correlate this effect with the visual outcome.

Primary outcome

Change in the posterior corneal curvature at 6 months.

Secondary outcomes

Change in best corrected visual acuity at 6 months in comparison to baseline acuity.

To find a correlation between change in best corrected visual acuity and change in posterior corneal curvature.