EVALUATION OF THE ACCURACY OF SBK MICROKERATOME IN FLAP CREATION DURING LASIK SURGERY

Thesis

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بسم الله الرحمن الرحيم

قَالُوا سُبْحَانَكَ لاَ عِلْمَ لَنَا
إِلاَّ مَا عَلَّمْتَنَا إِنَّكَ أَنتَ الْعَلِيمُ
الْحَكِيمُ

صدق الله العظيم
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Abstract

Purpose: To evaluate the accuracy of SBK microkeratome in flap creation during myopic LASIK surgery using Anterior Segment Optical Coherence Tomograhy.(AS OCT)

Design: A Prospective non-randomized non comparative interventional clinical study.

Methods: Flaps were created using the One Use-Plus SBK microkeratome (intended flap 90µm) in 100 eyes of 50 patients. Flap thickness was measured using AS OCT one week after surgery.

Results: The mean achieved central corneal flap thickness in both eyes was 88.67±7.19, 1.33µm thinner than the intended 90 µm thickness (difference from intended thickness -1.33±7.19) with a p value of 0.067 which is statistically insignificant (p>0.05). The mean achieved central corneal thickness in the right eye was 88.56 ± 7.95 µm, (ranging from 70 µm to 112µm), 1.44 µm thinner than the intended 90 µm (difference from intended thickness -1.44 ±7.95) thickness with a p value of 0.206 which is statistically insignificant (p>0.05). The mean achieved central corneal flap thickness in the left eye was 88.78 ± 6.41 µm,(ranging from 77µm to 105µm) showing a difference from intended thickness of -1.22±6.41µm deviation from the intended thickness that is statistically insignificant (p value of 0.185, p>0.05).

Conclusion: In the current study it was found that the use of the One Use-Plus SBK microkeratome for creating an SBK flap is safe and effective. The results of the current study were comparable to the results in previous studies using a femtosecond laser. In conclusion, our results indicate that the the One Use-Plus SBK microkeratome created flaps with good central accuracy, predictability and reproducibility, with variable increase in flap thickness towards the periphery.

Recommendations for future research: Studying the effect of variations in flap thickness on post-operative visual outcomes. The effect of flap thickness on corneal biomechanical stability. Increasing sample size. Assessing of flap thickness accuracy using a more objective tool such as real-time online optical coherence pachymetry.

Key words:

LASIK, SBK Microkeratome, Femtosecond laser, Ectasia, Myopia

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List of Abbreviations

µm	**Micrometer**
AS OCT	**Anterior Segment Optical Coherence Tomography**
BCVA	**Distant Best Corrected Visual Acuity**
BUT	**Break up time**
CCT	**Central corneal thickness**
CD	**Corneal diameter**
CSNFs	**Corneal sub-basal nerve fibers**
DLK	**Diffuse lamellar keratitis**
ECM	**Extracellular matrix**
FS	**Femtosecond laser**
FS-LASIK	**Femtosecond assisted LASIK**
HOAs	**Higher order aberrations**
IFS	**Intralase femtolaser**
IOP	**Intraocular pressure**
K	**Keratometry**
kHz	**Kilo Hertz**
LASIK	**Laser assisted in situ keratomileusis**
MMPs	**Matrix metalloproteases**
MRSE	**Mean refractive spherical equivalent**
OBL	**Opaque bubble layer**
OUP-SBK	**One Use-Plus SBK microkeratome**
PRK	**Photorefractive keratectomy**
RSB	**Residual stromal bed**
SBK	**Sub-Bowman's keratomileusis**
SD	**Standard deviation**
SKMB	**Summit-Krumeich-Barraquer microkeratome**

TLSS	**Transient light sensitivity syndrome**
UCVA	**Uncorrected visual acuity**

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INTRODUCTION

Over the past decades, laser in situ keratomileusis (LASIK) has become the most common refractive procedure for the correction of refractive errors[1]**.** The consistency and predictability of the corneal flap thickness is crucial in producing successful LASIK outcomes. The corneal flap thickness is directly related to LASIK predictability and safety; therefore, methods that improve the predictability and minimize the degree of variation in corneal flap thickness are worthy of attention.[2]

Today, a variety of microkeratomes, as well as femtosecond lasers, are in clinical use for flap creation.[3] Good microkeratomes are associated with accurate cuts, less flap variation, easy manipulation, and fewer complications. [4]

One of the most feared complications is post LASIK corneal ectasia. Among many other factors the residual corneal thickness after the ablation is crucial for decreasing the possibility of that complication. Also it has been shown that the thinner the flap the less risk for ectasia. Accuracy of the flap thickness produced using mechanical microkeratomes is crucial in this calculation.

Earlier studies using microkeratomes showed that there was a high deviation from the marked thickness for a given blade. Hence the development of the Sub Bowman's keratomileusis microkeratome (SBK) with 90 microns thickness has shown high reproducible accuracy in different recent studies. This has made this type of mechanical microkeratome a competitor for Femtolaser flap creation that is gaining popularity in recent years with a main advantage of creating an accurate thin sub-Bowamn flaps. In this study we will measure the accuracy of flap thickness using the SBK microkeratome. [5-7]

AIM OF THE WORK

- Major objective is studying the accuracy of the thickness of the LASIK flap created by the mechanical microkeratome SBK using anterior segment optical coherence tomography.
- Minor objective includes recording any associated complications.

ANATOMY OF THE CORNEA

The cornea is a transparent avascular connective tissue that acts as a structural barrier of the eye. Together with the overlying tear film, it also provides a proper anterior refractive surface for the eye. Its clarity is the result of many factors including the structural anatomy and physiology of its cellular components[8]. In the average adult, the horizontal diameter of the cornea is 11.5 to 12.0 mm and about 1.0 mm larger than the vertical diameter. It is approximately 500µm thick at the center and gradually increases in thickness toward the periphery. The shape of the cornea is prolated (flatter in the periphery and steeper centrally). [9] The human cornea consists of 5 recognized layers, 3 cellular (epithelium, stroma, endothelium) and 2 interface (Bowman membrane, Descemet's membrane) as demonstrated in Figure 1.[8]

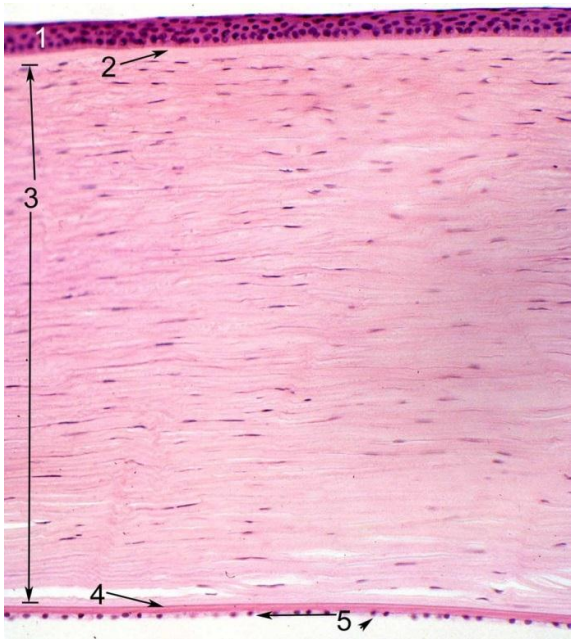

Figure 1. Light micrograph of the anatomical layers of the cornea: (1)Epithelium, (2) Bowman membrane, (3)Stroma, (4)Descemet's membrane, (5) Endothelium.[8]