Comparison Between Laser in Situ Keratomileusis (LASIK) and Laser Epithelial Keratomileusis (LASEK) for correction of low to moderate myopia

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بِسۡمِ ٱللَّهِ ٱلرَّحۡمَٰنِ ٱلرَّحِيمِ

وَٱللَّهُ أَخۡرَجَكُم مِّنۢ بُطُونِ أُمَّهَٰتِكُمۡ لَا تَعۡلَمُونَ شَيۡـٔٗا وَجَعَلَ لَكُمُ ٱلسَّمۡعَ وَٱلۡأَبۡصَٰرَ وَٱلۡأَفۡـِٔدَةَۙ لَعَلَّكُمۡ تَشۡكُرُونَ ٧٨

سـورة النـحل [78]

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CONTENTS

LIST OF ABBREVIATIONS

ArF	Argon Fluoride
BCVA	Best corrected visual acuity
BSCVA	Best spectacle-corrected visual acuity
BSS	Balanced salt solution
D	Diopter
DLK	Diffuse Lamellar Keratitis
F	Fluorine
FDA	Food and drug administration
HSV	Herpes simplex virus
HZV	Herpes zoster virus
Hz	Hertz
IOP	Intraocular pressure
LASEK	Laser assisted Subepithelial Keratectomy or Laser Epithelial Keratomileusis
Laser	Light amplification by stimulated emission of radiation
LASIK	Laser in situ Keratomileusis
Maser	Microwave amplification by stimulated Emission of radiation
NaCl	Sodium Chloride
NSAIDs	Nonsteroidal anti-inflammatory drugs
PAS	Periodic acid Schiff
PMMA	Polymethylmethacrylate
PRK	Photorefractive Keratectomy
PTK	Phototherapeutic keratectomy
RK	Radial keatotomy
TGF- β	Transforming growth factor β
UCVA	Uncorrected visual acuity
Xe	Xenon
XeCl	Xenon Chloride
XeF	Xenon Fluoride

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The aim of this essay is to review the literature describing LASIK and LASEK procedure regarding their efficacy, safety and complications in correction of low to moderate myopia.

Introduction

INTRODUCTION

Myopia, commonly referred to as short sightness, is a common cause of visual disability throughout the world. The World Health Organization has grouped myopia and uncorrected refractive error among the leading causes of blindness and vision impairment in the world **(Fredrick, 2002)**.

The prevalence of myopia is about 20% in the United States population, but varies with age, sex, race, ethnicity, occupation, environment, and other factors in various sampled populations **(Curtin, 1985 and Mutti and Zadnik, 2000)**.

People with myopia can be classified in two groups

GROUP 1 those with low to moderate degrees of myopia (referred to as "simple" myopia, 0 to 6 dioptres)

GROUP 2 those with high or pathological myopia (greater than 6 dioptres).

Myopia can be corrected with spectacles or contact lenses **(Fredrick, 2002)**.

Over the past decade, refractive surgery has become increasingly popular. As most patients seek a life without glasses or contact lens. Surgeons have sought a procedure that provides consistent results, rapid recovery, and most important, an excellent safety profile **(Seiler et al., 1991)**.

Refractive surgery entered a new era with the introduction of the excimer laser. The excimer laser has been used for refractive surgical correction since the introduction of photorefractive keratectomy in 1983 **(Trokel et al., 1983)**.

Photorefractive keratectomy (PRK) has proved to be safe and effective for treating low to moderate myopia **(Seiler**

et al., 1991 and Kitazawa et al., 1999). However, the relatively long recovery period about 14day, and complications, especially stromal haze **(Wang et al., 1997 and Alio et al., 1998)**, have led many surgeons to perform Laser In Situ Keratomileusis (LASIK).

The rapid recovery and good visual acuity achieved by LASIK patients, have led to an increase in the number of refractive procedure. This has unfortunately brought a rise in complications unique to LASIK especially flap related complications **(Claringbold, 2002)**.

Laser assisted subepithelial keratectomy (LASEK) is a recent modification of photorefractive keratectomy (PRK) inroduced by **Camellin (1999)**. In this procedure, the epithelium is partially removed from Bowman's layer, connected only at a hinge. Laser treatment is applied to Bowman's layer and anterior stroma. Then the epithelium is repositioned and covered by bandage contact lens **(Shah et al., 2001)**.

LASEK seems to be an effective and safe procedure for treatment of low and moderate myopia. It combines the advantages of both PRK and LASIK while eliminating their disadvantages. LASEK can be used in some cases in which LASIK is contraindicated as in cases of thin cornea and glaucoma suspects, and may be more adaptable to cutomized wavefront ablation **(Abu-Hussain, 2003)**.

Anatomy

ANATOMY

Refractive surgical procedures for myopia work by altering corneal anatomy to create a new shape flatter in the center with steeper periphery **(Waring et al., 1991)**.

The cornea is formed of two surface layers, the epithelium and the endothelium, with central filling stroma. All three layers receive nourishment and oxygen from the tears, aquous humor and limbal vessels **(Mishima et al., 1966)**.

Precorneal tear film

The precorneal tear film is approximately 7 μm thick with volume of 6.2 $\pm$2 μL during normal tear production. Tear fluid is typically produced at a rate of 1.2 μL/minute. Its major portion is drained through the nasolacrimal duct and a smaller volume lost through evaporation from ocular surface. It provides lubrication and smooth optical interface with air. It provides natural immunity to infectious agents **(Mishima et al., 1966)**.

THE CORNEA *[Fig. (1)]*

EPITHELIUM

The corneal epithelium is stratified squamous and non keratinized. It is continuous with that of the conjunctiva at corneal limbus but differ strikingly in possessing no goblet cells. The epithelium is 50-90 μm thick and consists of 5 or 6 layers of nucleated cells **(Reinstein et al., 1994)**.

It is about 10% of corneal thickness. The refractive effect of the corneal epithelium is relatively unknown but it can account for 1.03 D of the eye optic power at the central 2 mm diameter optic zone **(Simon et al.,1993)**.

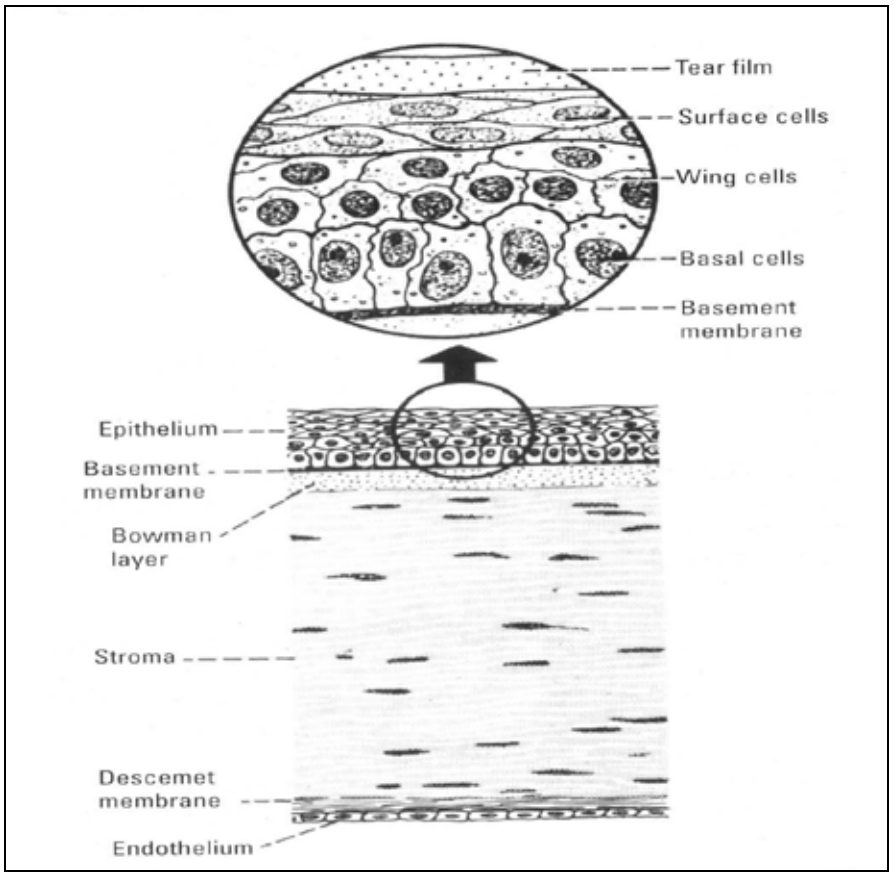

Fig. (1): Anatomy of the cornea **(Kanski, 2003)**

The Basal cells

They stand in a palisade like manner in perfect aligment on the basal lamina. They are columnar 10 μm wide and 15 μm tall with rounded heads and flat bases. Each nucleus is oval and oriented parallel to the cell's long axis **(Born et al., 1997)**.

The Wing cell

They are 12-15 μm in diameter. They are distinguished by a variety of polygonal shapes and their large ovoid nuclei. Their cytoplasm contain few rough endoplasmic reticulium