Descemet Stripping Automated Endothelial Keratoplasty

Essay

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Hossam Awad Elsayed Eid

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List of Abbreviations

AAC	:	Artificial Anterior Chamber
ABK	:	Aphakic Bullous Keratopathy
ALK, ALKP	:	Anterior Lamellar Keratoplasty
BCVA	:	Best Corrected Visual Acuity
BSS	:	Balance Salt Solution
CDB	:	Chemically Defined Bioadhesive
CMV	:	Cytomegalovirus
DALK	:	Deep Anterior lamellar Keratoplasty
DLEK	:	Deep Lamellar Endothelial Keratoplasty
DM	:	Descemet's Membrane
DMEK	:	Descemet's Membane Endothelial Keratoplasty
DSAEK	:	Descemet's Stripping Automated Endothelial Keratoplasty
DSEK	:	Descemet's Stripping Endothelial Keratoplasty
DX	:	Descemetorhexis
DXEK	:	Descemetorhexis and Endothelial Keratoplasty
ECD	:	Endothelial Cell Density
EK	:	Epithelial Keraoplasty
FDLEK	:	Flap Associated Deep Lamellar Endothelial Keratoplasty
FGF	:	Fibroblast Growth Factors

List of Abbreviations (Cont.)

FS	:	Femtosecond
HOA	:	High Order Abbrations
ICE	:	Iridocorneal Endothelial Syndrome
ICG	:	Indocyanine green
IOL	:	Intra Ocular Lens
LASIK	:	Laser Insitu keratomiluesis
LKP, LK	:	Lamellar Keratoplasty
MALK	:	Mid Anterior Lamellar Keratoplasty
µ	:	Micron
mm	:	Millimeters
mm2	:	Cubic millimeters
PBK	:	Pseudophakic Bullous Keratopat
PGF	:	Primary Graft Failure
PKP, PK	:	Penetrating Keratoplasty
PLK	:	Posterior Lamellar Keratoplasty
PLKP	:	Posterior Lamellar Keratoplasty
PPMD	:	Posterior Polymorphous Corneal Dystrophy
SALK	:	Suprficial Anterior Lamellar Keratoplasty
SL OCT	:	Slit Lamp Optical Coherence Tomography
SL	:	Slit Lamp
TALK	:	Total Anterior Lamellar Keratoplasty
Tencell	:	True Endothelial Cell Transplantation

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Introduction

Posterior Lamellar Keratoplasty (PLKP) is defined as any corneal lamellar procedure where the Descemet's membrane and endothelium are excised with host corneal stroma[(1)].

Endothelial Replacement Surgery is necessary for visual rehabilitation, when the medical therapy of steroid drops and, or topical hypertonic saline are the only option for endothelial transplantation has been full-thickness penetrating keratoplasty (PKP). Approximately 40% of all penetrating keratoplasties are performed for diseases of the corneal endothelium[(2)].

Although PKP procedure can provide excellent stromal graft clarity, but the wound never heals to become as strong as virgin cornea, and patients who undergo PK are at increased risk of traumatic injury for the remainder of their lives[(3)].

Other complication as corneal sutures which result in irregular astigmatism and corneal ulceration, vascularization and graft rejection. Posterior lamellar keratoplasty is a new and exciting surgical alternative to standard full-thickness penetrating keraloplasly for the treatment of corneal endotheial disorders[(4)].

Selective replacement of the dysfunctional posterior portion of the cornea offers distinct advantages compared with penetrating keratoplasty, including improved surface topography with reduction of post-surgical astigmatism, reduced risk of expulsive hemorrhage as this procedures occur in closed-system , reduced immunologic rejection against the grafted endothelium due to the reduced amount of foreign surface antigens on the recipient cornea, and the presence of the recipient cornea's own anti-inflammatory and antiangiogenic corneal epithelium[(5)].

So the PLKP procedure appears to avoid the problems of PKP by allowing endothelial replacement without the need for full-thickness corneal incisions or sutures. The techniques of endothelial keratoplasty (EK) progressed from large incision deep lamellar EK (DLEK), to small incision DLEK, and then to Descemet's stripping EK (DSEK), followed by DSAEK, each new technique avoid the problems of previous one either during procedure or postoperative[(6)].

Aim of The Work

The aim of this work is to emphasis on Descemet Stripping Automated Endothelial Keratoplasty (DSAEK) as a novel technique of endothelial keratoplasty regarding its indications, advantages , disadvantages and complications .

Anatomy of The Cornea

Gross Anatomy

The cornea is the transparent, anterior, avascular part of the globe corresponding to a watch crystal. It is slightly elliptic horizontally and measures about 12 mm in the horizontal meridian and 11 mm in the vertical meridian. The cornea is thinner centrally, averaging about 0.58 mm. whereas the periphery measures approximately 1 mm in thickness. The cornea has 70% of the total refractive power of the eye. The central one third of the cornea (optical zone) is almost spherical and flattens peripherally[(7)].

Microscopic Anatomy

The cornea consists of five layers, epithelium, bowman's layer, stroma, descemet's membrane and endothelium.

Epithelium

Epithelium consists of a five-cell layer with three types of cells, columnal basal, polygonal wing and flat superficial cells. The deeply situated basal cells comprise the single layer of flat base cells that rest on the basement membrane. These cells are rounded on their anterior surface with oval nuclei arranged perpendicularly to the surface. The New cells migrate superficially to become wing cells. The wing cells comprise

three layers; the more superficial the cell, the flatter its appearance[8].

Bowman's layer

Bowman's layer is a cellular zone beneath the epithelium. The anterior margin is limited anteriorly by the basement membrane of the epithelium; the posterior border is formed by collagen fibers. Under the light microscope, Bowman's layer appears homogeneous, but the fine structure of Bowman's layer consists of short collagen fibers and fine fibrils. The collagen fibrils are randomly distributed but they are uniform in diameter; these fibers increase and gradually transform into the regular stroma[9].

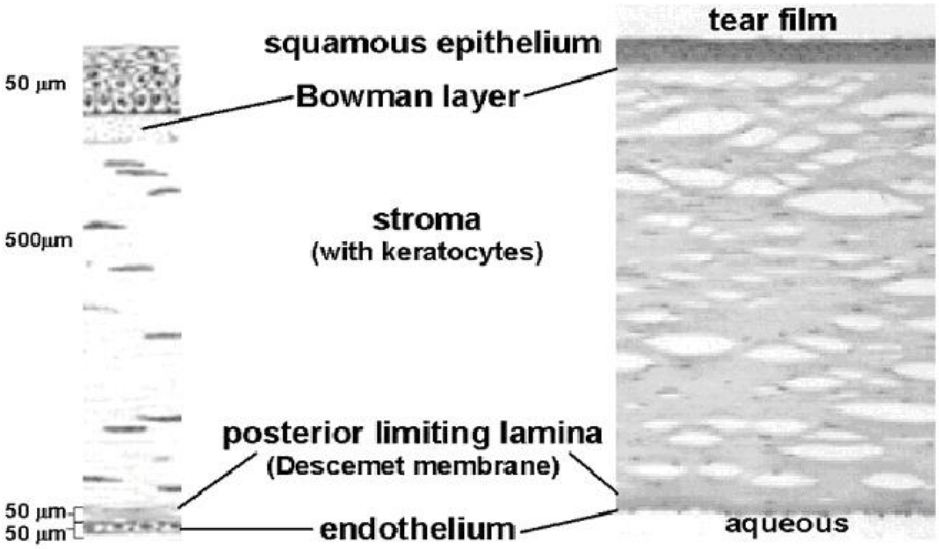

Fig. (1): Anatomical zones of the human cornea. The top represents the anterior (external) surface) of the cornea which is bathed by the tear film and the bottom is the posterior (aqueous) surface. The schematic on the left provides dimension and structural detail of the thin section light micrograph on the right.

Stroma

The stroma, which constitutes about 90% of the cornea, consists primarily of collagen fibers, stromal cells and ground substance. It is well known that the bundles of collagen fibers are arranged into lamellae parallel to the surface. The collagen bundles in the anterior zone are small but not clearly defined or regular in size and arrangement as those found in the posterior portion of the stroma. Interlacing lamellae cross each other at right angles in a highly regular fashion, and layers of lamellae run parallel to each other and to the surface of the cornea. Each lamella runs through the full length of the cornea and is made up of a multitude of collagen fibers. The layered arrangement of the fibers facilitates lamellar dissection of the cornea. The collagen fibrils account for about 80% of the dry weight of the cornea; the ground substance, for about 15%; and cellular elements, for only about 5%. The keratocyte is a large flat cell with a number of large processes that extend out from beyond the cell body in a satellite fashion. The cells are seen between packed collagen lamellae; the tips of the processes touch neighboring cells[(10)].

Descemet's membrane

Descemet's membrane is 10 μm thick and is a true cuticular membrane that covers the posterior portion of the