New Innovation In Keratoplasty

Essay

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Of Master ***in Ophthalmology***

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الطرق المستحدثة فى عمليات زراعة القرنية

توطئة للحصول على درجة الماجستير

فى طب وجراحة العيون

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Content

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List of Abbreviations

AC	: Anterior champer
ACS	: Automated Corneal Shaper
ALTK	: Automated Lamellar Therapeutic Keratoplasty
BSCVA	: Best spectacle-corrected visual acuity
BSS	: Balanced salt solution
CME	: Cystoid macular edema
DALK	: Deep anterior lamellar keratoplasty
DLEAK	: Deep lamellar automated endothelial keratoplasty
DLEK	: Deep lamellar endothelial keratoplasty
DMEK	: Descemet's membrane endothelial Keratoplasty
DSAEK	: Descemet's striping automated lamellar keratoplasty
DSEK	: Descemet's stripping endothelial keratoplasty
DSLEK	: Descemet's stripping lamellar endothelial keratoplasty
DXEK	: Descemetorrhexis with endothelial Keratoplasty
ECD	: Ectatic corneal disorder
GDCD	: Gelatinous Drop-like corneal dystrophy
LASIK	: Laser in situ keratomileusis
LCD	: Lattice corneal dystrophy
LK	: Lamellar keratoplasty
OVD	: Ophthalmic visco surgical device
PACD	: Posterior Amorphous corneal Dystrophy
PK	: Penetrating keratoplasty
PTK	: Phototherapeutic keratectomy
RBCD	: Reis Buckler corneal Dystrophy
STCT	: Selective tissue corneal transplantation

الملخص العربى

زراعة القرنية أو مايعرف بعملية ترقيع القرنية هو اجراء جراحى يتم من خلاله استبدال القرنية المريضة او المتضررة بقرنية أخرى تم التبرع بها من شخص لا يعرف انة يعانى من أية امراض قد تؤثرعلى حيوية الأغشية المتبرع بها.

يعد الترقيع النافذ هو الاجراء الأمثل لعلاج اى خلل بالقرنية ، ساعد على ذلك التطور من جهة الالات والتقنيات الجراحية التى

استخدمت لخياطة القرنية مما ادى بدورة الى تحسن الإبصار بالعين بعد اجراء الجراحة.

الترقيع الطبقى للقرنية هو اجراء جراحى يتم من خلالة زرع اجزاء معينة من انسجة المتبرع بعد ازالة الاجزاء المريضة المقابلة من قرنية المستقبل وقد تتطورت تلك العملية تطورا" سريعا" لتشمل الترقيع الطبقى الامامى و الخلفى وساعد على ذلك كونها ادت الى نتائج تماثل تلك الناتجة عن الترقيع النافذ مع تميزها بقلة معدل رفض الجسم للانسجة المزروعة مع قابلية تلك الانسجة للبقاء داخل العين لمدة اطول.

كل ذلك الجهد يوضح التغير الجذري من الترقيع القرني النافذ المعاد للتقنيات الحديثة باستخدام الطبقة الطلائية بما لها من مردود جيد من عدم حدوث إختلال في سطح القرنية.

أدى وجود تقنيات جديدة على مدة الخمس وعشرون عاماً الماضية إلى اتساع تطبيقات تلك العملية في التأهيل البصري وباستخدام الآلات الحديثة مثل القواطع الجراحية الدقيقة وجهاز الموجات فوق الصوتية لقياس سمك القرنية والغرف الصناعية الأمامية والأكزيمر ليزر أدى إلى زيادة قدرتنا على العمل بطريقة أكثر أماناً في ظل البيئة الجراحية الدقيقة . وبالتقدم في مثل هذه الجراحات مثل الترقيع الطبقي الأمامي والخلفي مكننا أن نستبدل الطبقة الطلائية الخلفية فقط وحقق ذلك نجاحاً أفضل في تحسن الإبصار وقلل معدلات الرفض في الأنسجة حيث أنه يتم ترقيع جزء من النسيج وليس النسيج كله .

هذة الايام هى حقبة الفمتوسكند ليزر و الذى انتشر استخدامة كبديل لمعظم الخطوات الجراحية التى كانت تتم باستخدام السكاكين الجراحية الدقيقة كونة يستطيع القيلم بقطع السمك المحدد تماما" ، لذلك يعقد علية امال كبيرة لتحسين و تيسير طرق اداء عمليات ترقيع القرنية و كذلك النتائج المرجوة منها.

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Introduction

The cornea is an apparently simple structure which can be afflicted by almost the full range of pathological processes responsible for human disease. Because it requires an undisturbed ultra-structure to function normally in the optical Sense, minor disturbances of the cornea can have devastating consequences for vision. The clear, inert, glass-like appearance of the cornea is misleading. It is a vital tissue with demanding metabolic and cellular requirements **(Goldstein, 2007).**

Blindness is a major public health problem in most developing countries. Worldwide, Corneal disease is second only to cataract as a cause of blindness, it is estimated that about 30% of all blindness in some developing countries, while the corresponding rate in most developed countries is very low **(Thylefors,et al, 2005).**

The transparency of the cornea can be damaged by disease or by injury to a degree which affects vision by causing a scar which may develop from abrasion, laceration, burns or any other corneal diseases, position of the scar being peripheral or central, also the density of this scar affect the vision alternatively.

Corneal transplantation also known as corneal grafting (penetrating keratoplasty) is an operation that is carried out to replace a cornea that has become opaque (not transparent) with a new transparent one, which is either has been removed from a recently deceased individual having no known diseases which might affect the viability of the donated tissue (allograft), or usage of donor tissue from the fellow eye of the same patient (autograft) **(Al-Yousuf, et al, 2004).**

The first successful human corneal transplant was performed by Von Hippel in 1886 and was a lamellar procedure. Lamellar keratoplasty was performed more often

than penetrating keratoplasty for the treatment of corneal opacities in the first half of the 20th century **(Von Hippel, 1934).**

In the 1950s, Eascott and Barraquer in 1954 developed the technique of "cryolathing," which enabled donor corneas to be frozen, carved on a modified jeweler's lathe, and then transplanted into a recipient's eye. There were only a few advances in LK procedure and technology until recent years, when interest in lamellar procedures once again raised, primarily for refractive indications **(Eascott & Barraquer,1954).**

Lamellar keratoplasty (LK) was introduced as a logical step in the surgical treatment of corneal opacification where the endothelium remains functional. Unlike penetrating keratoplasty, in lamellar keratoplasty the donor endothelium is not a consideration. By preserving the recipient's own healthy endothelium the risk of endothelial rejection is virtually eliminated **(Sugita&Kondo, 2005).**

Deep anterior lamellar keratoplasty (DALK) is a surgical procedure for removing the corneal stroma down to Descemet's membrane. It is most useful for the treatment of corneal disease in the setting of a normally functioning endothelium, **(Anwar & Teichmann, 2002).**

Endothelial keratoplasty (EK) has been introduced in three forms according to Melles in 1998: The first form is Deep Lamellar Endothelial Keratoplasty (DLEK) in which the posterior part of the recipient's cornea is replaced by donor tissue (**Terry, 2001).**

The second form is Descemet's Stripping (Automated) Endothelial Keratoplasty (DSEK/DSAEK) in which the diseased Descemet's membrane is removed and replaced by a healthy donor posterior transplant. DSEK/DSAEK uses only a

small incision that is either self-sealing or may be closed with a few sutures (**Gorovoy, 2006).**

The third form is Descemet's Membrane Endothelial Keratoplasty (DMEK) is the most recent EK technique in which an isolated Descemet's membrane is transplanted. The DMEK procedure combines the anatomical benefits of DSEK/DSAEK with visual rehabilitation to 20/40 or better within the first month in approximately 90% of cases **(Melles , 2006).**

Aim of the Work

Aim of the work is to discuss the new innovations in Keratoplasty regarding the new approaches and new techniques.

Anatomy of the Cornea

The transparent cornea forms the anterior one-sixth of the eyeball. Because its curvature is greater than over the rest of the eyeball, a slight sulcus marks the junction of the cornea with the sclera. Seen from the front, the cornea is convex but somewhat elliptical in shape **(Snell & Lemb, 1998)**.

The external dimensions of the cornea are 11.6 to 12.6 mm horizontally and 10.6 to 11.7mm vertically. These measurements are approximately 0.1mm less in females. When viewed from the anterior surface, the cornea is oval because of a more prominent limbus superiorly and inferiorly. When viewed posteriorly, the cornea is circular and has a diameter of 11.6 mm. The thickness of the cornea varies from 0.51 to 0.56 mm centrally and from 0.63 to 0.67 mm peripherally. However, peripherally the thickness has been measured as high as 0.74 mm in normal individuals. Posteriorly, the corneal endothelium is bathed by the aqueous humor. The surface area of the cornea is approximately 1.3 ^{cm2} or approximately one-fourteenth the area of the globe. The height of the cornea (i.e., the distance from a plane through the peripheral visible border of the cornea to the apex of the cornea externally) is 2.68 mm **(Klyce & Beuerman, 1988)**.

Because the curvature of the cornea is greater than that of the scleral shell, a slight sulcus, the external scleral sulcus, marks the junction between the cornea and sclera. The radius of curvature of the anterior surface of the cornea ranges from 7.2 to 8.4 mm, and the radius of curvature of the posterior surface ranges from 6.2 to 6.8 mm in white men. The cornea is more curved in Asians than in whites and in women than in men. Although a wide variety of different corneal shapes can be seen between individuals, it is

frequently more curved at the temporal cornea than the nasal cornea and in the vertical plane than in the horizontal plane; the optical zone of the cornea is the central one-third, approximately 4 mm in diameter. The anterior and posterior surfaces of the cornea are relatively spherical in this region. However, they tend to diverge as they extend toward the periphery, where the cornea is slightly flattened. However, in individuals with some degree of corneal astigmatism the central optical zone may be somewhat ellipsoidal. (Fig. 1) **(Klyce & Beuerman, 1988).**

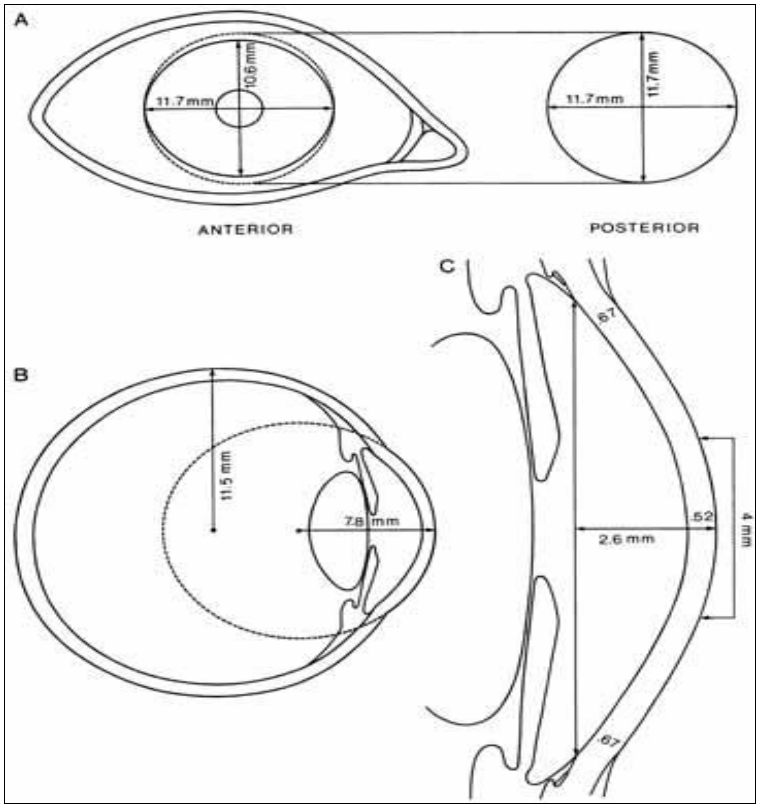

Fig. (1): (A) Anterior and posterior diagram of the corneal edges showing the elliptic shape anteriorly and the round shape posteriorly. (B) The corneal height and the central 4 mm of the cornea, which is optically important. (C) The comparative thickness of the central and peripheral cornea **(Duane, 2005).**