Light at the end of the tunnel - Changing face of Corneal Transplantation!

Dr. Vishram Sangit

Chief Ophthalmologist and Senior Corneal Transplant surgeon,
Jupiter Netralay, Jupiter hospital.
Email : vishramsangit@rediffmail.com

Corneal blindness is one of the leading causes of reversible blindness, particularly in the developing nations. In India nearly 7.5 lac people are blind due to corneal diseases. Corneal infections, corneal scars and corneal edema are the major causes of corneal blindness. Corneal transplantation is the ultimate solution to restore the structural integrity and the vision when medical therapy fails. Corneal transplantation remains the most successful form of human organ transplantation till date, principally due to the relatively avascular nature of the cornea and aditionally due to improved techniques and concepts that have evolved over the last 2 decades. Full thickness corneal transplantation referred to as penetrating keratoplasty (PK) was first performed successfully by Edward Conrad Zirm in 1904 (Fig. 1). At around 1944, the first eye bank came into existence in Manhattan, thanks to Townley Paton, who envisaged eye banking . Initial corneal transplants were square shaped and later surgeons started performing circular transplants as circular corneal trephines came into existence. It took a long time to refine the techniques, develop better instrumentation and consolidate the results and success rates of corneal transplants. Alongside, eyebanking as a science, comprising of corneal tissue harvesting, storage, tissue evaluation and laying down standards also went through a long journey to metamorphose into the modern day eye banking scenario.

Today the corneal tissue harvesting is in the form of corneoscleral button excised within 8 hours of the donor's death. The corneoscleral button is immediately transferred into a storage medium called McKarey Kauffman medium which can store the cornea for upto 4 days or other liquid storage media (Cornisol or Optisol) which can store the cornea upto 14 to 21 days. HIV, Hepatitis B, Hepatitis C , Septicaemia, Brain metastasis of any malignancy, chemotherapy within 3 months of death are the current contraindications to corneal donation. The corneal button is then thoroughly evaluated clinically and by a specular microscope to evaluate the endothelial cell quantity and quality to decide on the ultimate tissue quality for appropriate use of that corneal tissue. No Blood or HLA matching is required.

A conventional penetrating keratoplasty (PK) is performed using 10-0 nylon sutures (either 16 interrupted or a combination of interrupted and continuous sutures).Post operatively steroid eye drops and lubricants are continued for atleast 2 to 3 years. Oral immunosuppression is reserved only for high risk grafts. Sutures are removed periodically depending upon the spectacle power to reduce astigmatism or when sutures become loose or get vascularised. Graft infection, steroid induced cataract and glaucoma and allograft rejection are some of the common complications seen after corneal transplantation.

In the late 90s, selective endothelial transplantation or endothelial keratoplasty (EK), gained significant momentum for use in cases of endothelial diseases of the cornea , principally Fuchs' endothelial dystrophy and bullous keratopathy (corneal edema following cataract or other intraocular surgeries).

Endothelial keratoplasty (EK) as it is termed, itself went through a series of modifications and finally became accepted as DSEK (Descemets stripping and endothelial keratoplasty) in which only the diseased descemets membrane endothelial complex (upto 50 micron thick) is removed and replaced by healthy disc of endothelial cells and a part of the corneal stroma (upto 100 micron thick) (Fig. 2). This form of transplant is essentially sutureless as the donor corneal tissue is held in place by the pressure of air bubble maintained inside the anterior chamber of the eye. More recently only the donor Descemets membrane and endothelium is being transplanted into the recipient which is termed as Descemets membrane endothelial keratoplasty (DMEK).

The main advantage of these forms of endothelial keratoplasty over conventional PK have been the reduced rate of allograft rejection and quicker visual rehabilitation with added ease of postoperative follow-ups due to absence of suture related complications like suture infections and vascularisation. Also the visual quality and magnitude of spectacle correction is better as compared to

International Journal of Surgical Cases | eISSN 2321-3817 | Available on www.surgicalcasesjournal.com/ |

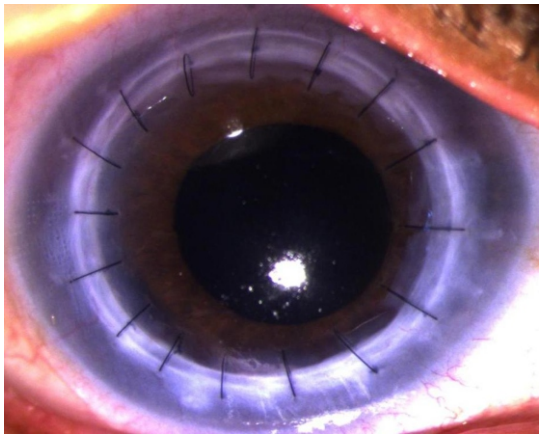

Figure 1: Full thickness corneal transplantation referred to as penetrating keratoplasty (PK)

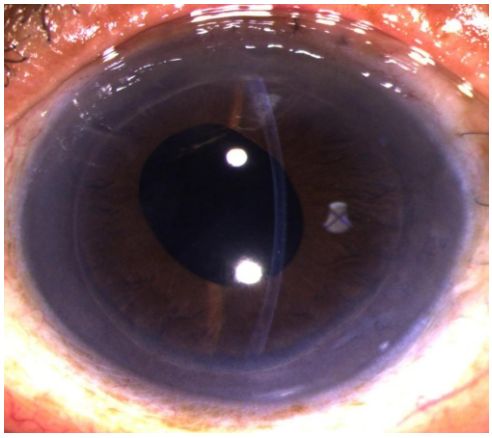

Figure 2: Descemets stripping and endothelial keratoplasty (DSEK)

conventional PK. However these procedures have a relatively steep learning curve requiring significant volume of cases for adequate learning and practice.

Deep anterior lamellar keratoplasty (DALK) is a diametrically opposite and an old concept of corneal transplantation, wherein only the Descemets endothelial complex of the recipient are retained and the overlying diseased corneal stroma is replaced by a healthy donor corneal stromal tissue. DALK is principally performed for corneal scars, advanced keratoconus and corneal dystrophies involving the corneal stroma but sparing the descemets membrane and endothelium. This form of corneal transplant is also an extremely skilled procedure with a steep learning curve. The risk of allograft rejection is the least among all forms of corneal transplantation.

Constantly evolving techniques and refinement in instrumentation has led to significant improvement and consistency in outcomes of corneal transplantation. Better vacuum trephines and motorized keratomes allow exact depth of penetration and dissection of the corneal tissue. Recently Femtosecond laser has been successfully introduced to perform Femto assisted Lamellar keratoplasty (FALK) to achieve better tissue coaptation and quicker visual recovery.

Although the results and graft survival have improved significantly over the last 2 decades, corneal allograft rejection still remains the major cause of corneal graft failure (irreversible corneal graft edema) .The risk of rejection is highest in the first 2 years but remains thereafter too. Discontinuation of local steroid eye drops, vascularised sutures, corneal graft infection and intraocular surgery are the usual triggers for rejection. Although corneal transplantation can be repeated for a failed corneal graft, cumulative risk of rejection and graft failure steadily increases after every consecutive graft.

In situations of repeatedly failed grafts, keratoprosthesis or simply artificial form of corneal transplant remains an effective technique to restore vision. A keratoprosthesis is an artificial optical device which is transplanted along with the natural donor cornea acting as a carrier for the device. This is usually made up of medical grade PMMA (polymethyl methacrylate) and thus remains clear even when the surrounding cornea becomes edematous. However keratoprosthesis has its own share of realistic problems and complications in the long run and hence reserved as the last resort after 2 or more failed grafts.

Inspite of technical advances, certain tenets still remain the cornerstone of a successful corneal transplant program and practice. A corneal transplantation of any form is a long term undertaking both on the part of the patient and the surgeon. Complete and clear communication needs to ensue regarding the need and goal of surgery, the risks of future complications and adverse events like glaucoma and allograft rejection. The need of compliance to long term medications and timely followup with the surgeon cannot be overemphasized. Patients also need to be sensitized to symptoms of early rejection viz

RSVP (redness, sensitivity to light , visual loss , pain) and educated to report early to the surgeon in the event of above symptoms which can go a long way to prevent graft failure. Cost of treatment, recurring costs in terms of medications, spectacles and contact lenses when required need to be considered.

In conclusion , a century old procedure - corneal transplantation has seen a sea change and is here to stay till bioengineered substrate corneal grafts become a successful reality. However, corneal grafts walk through diverse clinical situations and events. A ' never say die'attitude on the part of the surgeon as well as the patient, goes a long way in managing corneal transplants and preserving useful vision !

Conflict of Interest: Nil
Source of Support: None

How to Cite this Article

Sangit V. Light at the end of the tunnel - Changing face of Corneal Transplantation! International Journal of Surgical Cases 2016 Sep-Dec;2(2): 3-4.