The past decade has seen a paradigm shift in the management of corneal disorders from PKP (penetrating keratoplasty) to endothelial keratoplasties; and in the management of secondary intraocular (IOL) implantation from conventional sutured scleral fixation and iris retro-claw fixation to sutureless glued intrascleral IOL implantation. It is the conviction and transition that is responsible for the eventual revolutionary overthrow of the incumbent paradigm, and its replacement by a new one. Amalgamating the benefits of both these advancements can harvest and reap lot of benefit to the current select scenario of patients.

Post-traumatic cases with corneal opacities and lenticular disruption/dislocation is an ideal scenario to take precedence for glued IOL with corneal surgical intervention. Complicated cataract surgeries associated with posterior capsule rupture often lead to corneal decompensation. Corneal oedema and decompensation results from failure of the corneal endothelium to maintain deturgescence. The visual function of the five-layered cornea is dependent upon its shape and clarity. And each layer serves a vital role to its end.

Corneal decompensation beginning many years after IOL implantation may be due to excessive loss of endothelium at the time of surgery, followed by ongoing normal or accelerated attrition of the remaining endothelium. With the recent explosion of keratoplasty techniques for the treatment of corneal diseases, determining when to perform corrective surgery for IOL implantation in the setting of corneal disease is crucial for appropriate surgical planning. Glued IOL has been used previously in multiple situations including surgical aphakia, traumatic phacocele, dislocated IOL in bag, and in combination with femtosecond assisted keratoplasty. This chapter discusses considerations for deciding Glued IOL implantation along with the appropriate corneal procedure to be implemented for the remedy of corneal disorder.

The last decade has heralded a revolutionary shift in the treatment of corneal endothelial disease. Only 15 years ago, the only surgical treatment for pseudophakic bullous keratopathy and Fuchs dystrophy was penetrating keratoplasty (PK). Although used successfully for over a century, PK requires many months of refractive adjustments before the eye achieves visual stability. Starting with the advent of posterior lamellar keratoplasty in the late 1990s, a number of procedures have been developed, refined, and widely adopted, which have given patients faster recoveries and improved globe stability in comparison to traditional corneal transplantation. Preliminary results of the most recent form of Endothelial keratoplasty (EK), Descemet's membrane EK (DMEK), suggest that pure endothelial cell transplantation is on the horizon.
SURGICAL CONSIDERATIONS FOR COMBINED CORNEAL PROCEDURE:
The main advantage of combining EK and Glued IOL surgery is patient convenience. Patients undergo only one surgery, attend fewer appointments, and deal with only one set of postoperative medications.

Although a combined surgical procedure is not significantly more complex than EK surgery alone, a few concerns must be addressed, especially for novice surgeons. During the surgery, the surgeon must be prepared for a decreased view secondary to guttata or haze, decreased anterior chamber stability (in cases requiring explantation of a previous IOL), increased chances of graft dislocation (intraoperative miosis is often required), increased intraocular inflammation that may lead to increased endothelial cell damage, and a potential risk of problems with the anterior chamber air fill due to air diversion into the vitreous.

INJECTION OF AIR BUBBLE. The creation of an air bubble in the anterior chamber is an essential element of EK techniques including Descemet’s stripping endothelial keratoplasty (DSEK), Descemet’s membrane endothelial keratoplasty (DMEK), and their respective automated techniques (DSAEK and DMAEK).

There are no preset rules to determine when patients should have combined surgery versus Glued IOL surgery alone; however, the patient's preoperative history and examination are important tools for making this decision. Patients who report blurred vision upon awakening have corneal oedema and are more likely to show corneal decompensation after Glued IOL surgery alone. Specular microscopy may show an increased risk for corneal decompensation in severe cases in which the endothelial cell count is low, but this testing modality can be unpredictable in the presence of dense guttata. Corneal pachymetry has been suggested as a method for predicting corneal decompensation.

TARGET REFRACTION-
Performing IOL implantation before a corneal procedure involves lot of refractive instability and unpredictable keratometry values; therefore, predicting the lens implant power before a corneal procedure can present challenges. Studies of lens power calculations associated with keratoplasty have shown that an effective way of reducing postoperative ametropia is to perform keratoplasty first, followed by lens extraction and IOL implantation at a later date. Flowers et al reported 95% of patients within ±2.00 D of intended postoperative target refraction following PKP and cataract extraction with IOL placement performed secondarily.¹

The major advantages of Glued IOL surgery combined with EK as opposed to Glued IOL surgery combined with PKP include improvement in keratometric stability, decreased astigmatism after keratoplasty, and a reduction in IOL power errors due to better refractive outcomes.

Prior to the introduction of EK procedures, poor postoperative refractive results, with as little as 26% of eyes within ±2.00 D of intended target refraction, were reported.²

In the largest published review, EK was shown to routinely create a hyperopic refractive shift (range, 0.70 to 1.50 D; mean, 1.10 D) and induce minimal astigmatism (mean, 0.11 D).³ Taking these refractive considerations into account,
surgeons planning IOL implantation before or combined with EK should aim for 1.00 to 1.25 D of myopia to achieve emmetropia.

All the corneal procedures described herein are coupled with Glued IOL surgery. As it would be inappropriate to discuss glued IOL everywhere, a separate detailed description of the technique is rendered below; with just a small mention of the steps of Glued IOL as and when needed while describing the corneal counterpart.

**GLUED INTRASCLERAL HAPTIC FIXATION OF IOL (GLUED IOL):**

Glued IOL is a technique which is universally applicable in all cases which have gone awry due to a posterior capsule rupture irrespective of the size of capsular break. Two partial scleral thickness flaps are created 180˚ opposite followed by introduction of infusion in the eye in the form of AC maintainer or Trocar cannula. Sclerotomy is done with 20 G needle beneath the flaps about 1mm away from the limbus with the needle directed obliquely downwards towards the mid-vitreous cavity (Fig 1 A). Vitrectomy is done with a 25 G cutter introduced from the sclerotomy site and all the vitreous strands are cut thoroughly. Visualization of the vitreous strands can be enhanced with the use of triamcinolone acetonide. A corneal tunnel is fashioned and a 3-piece foldable IOL is loaded and the tip of haptic is slightly extruded from the cartridge demonstrating a ‘Lucky 7’ sign. The IOL is injected and the tip of leading haptic is grasped with a Glued IOL forceps introduced from the left sclerotomy site (Fig 1 B). The cartridge is slightly withdrawn so that the trailing haptic lies at the corneal incision. When the entire IOL has unfolded; the tip of the leading haptic is pulled and externalized from the left sclerotomy site with the help of Glued IOL forceps. The trailing haptic is grasped and flexed into the eye while the leading haptic is held by an assistant to prevent its slippage into the eye. Handshake technique is employed for the trailing haptic externalization wherein the IOL haptic is bimanually transferred from one glued IOL forceps to another under direct visualisation in the pupillary plane. When both the haptics are exteriorized (Fig 1 C); they are tucked in the scleral pocket created with a 26 G needle at the edge of the bed of flap just parallel to the sclerotomy site (Fig 1 D,E), preventing any further movement of the haptic and reducing pseudophacodonesis, minimizing the slippage and late re-dislocation. Vitrectomy is done at the sclerotomy site to ensure there is no vitreous traction postoperatively. Infusion is stopped, air is injected into the anterior chamber and the flaps are sealed with the application of fibrin glue (Fig 1 F); although complete scleral wound healing with collagen fibrils may take up to 3 months. As the haptic is snugly placed inside an intralamellar scleral tunnel, the IOL remains very stable from the early postoperative period. This method avoids additional corneal incisions or multiple sclerotomies, reduces surgical time, and intraocular pressure fluctuation by maintaining a closed system.

**‘NO ASSISTANT TECHNIQUE’ FOR GLUED IOL (NAT):**

This is a modification of the process of externalization of haptics in Glued IOL surgery where the leading haptic remains exteriorized throughout the procedure eliminating the need of an assistant to hold the haptic. The Handshake technique for trailing haptic is done beyond the mid-pupillary plane which changes the direction of action of vector forces thereby facilitating leading haptic externalization.
The technique has an advantage of overcoming all the difficulties like slippage, kink or breakage of the haptic associated with inadequate assistance.

**FIGURE 1 - GLUED IOL**

A – Two partial scleral thickness flaps made 180° apart, trocar infusion introduced followed by sclerotomy with 22 G needle approximately 1mm behind limbus beneath the scleral flap. The needle is entered into the eye in obliquely downward direction.

B – Glued IOL forceps is introduced from the left sclerotomy site and it grasps the tip of leading haptic. When the entire IOL unfolds, the haptic is pulled and externalized.

C – Glued IOL forceps is introduced from the right sclerotomy site; the tip of the trailing haptic is caught and externalized.

D – Two scleral pockets are made with a bent 26 G needle; one on either side. It is made parallel to the sclerotomy wound at the edge of the flap.

E – Haptics tucked into the scleral pocket

The haptic is grasped near the tip with the forceps and is then introduced into the scleral pocket on either side. The centration of the IOL can be adjusted by the amount of haptic tucked. After both the haptics are tucked, vitrectomy is done at sclerotomy site to cut any vitreous strand if present.

F – Fibrin glue application
SPECIAL CASE CONSIDERATION-

The placement of an IOL in its corrective position is very essential. Routinely in aphakic eyes, a foldable IOL is injected into the AC and its haptics are exteriorized through the sclerotomy site behind the iris. But, in cases of a posterior chamber (PC) IOL implanted in AC, the same IOL can be repositioned in a closed globe manner by exteriorizing its haptics through the sclerotomies. In cases of an ACIOL, explantation is advised and a new IOL is implanted by performing the glued IOL technique.

GLUED IOL WITH DESCEMET STRIPPING ENDOТЕHЕLIAL KERATOPLASTY (DSEK):

DSEK is a partial thickness corneal graft operation in which the inner endothelial layer is replaced.

Two partial scleral thickness flaps approximately 2.5 by 2.5 mm are made 180 degrees opposite to each other. An anterior chamber maintainer is introduced in the inferior quadrant (Fig 2 Top Left). A circular mark is placed on the patient's corneal surface and it serves as a guide for removal of the recipient Descemet's membrane (Fig 2 Top Right). The anterior chamber is entered through a peripheral stab incision, and Descemet's membrane is scored and detached as a single disc (Fig 2 Bottom Left). It is important not to damage the inner surface of the patient's cornea during this step of Descemet's membrane removal, since the inner corneal stroma will form half of the donor/recipient interface. A sclerotomy wound is created with a 20 G needle approximately 1 mm away from limbus beneath the scleral flaps and the entire glued IOL surgery is performed till the tucking of the haptics in the scleral pockets (Fig 2Bottom Right- Fig 3 A, B). An inferior peripheral iridectomy is performed to prevent postoperative air-bubble associated pupillary block glaucoma attack. AC maintainer helps to maintain the AC through out the surgery and the use of viscoelastic is deterred as it is important not to leave residual viscoelastic in the anterior chamber as it is thought to potentially hamper good adhesion between the donor corneal disc and the recipient corneal stroma.

Next, the donor cornea is mounted within an artificial anterior chamber and pressurized. Manual dissection is used to remove the anterior corneal stroma. The dissected donor corneal tissue is then placed with the epithelial side down and trephination is carried out from the endothelial side using a disposable trephine. The diameter of the trephine matches the diameter of the circular mark placed on the corneal epithelium of the recipient cornea made at the beginning of the procedure. The donor disc is about 150 microns thick.
FIGURE 2- DSAEK WITH GLUED IOL

TOP LEFT- Two partial scleral thickness limbal-based scleral flap of 2.5 mm X 2.5 mm are created 180° opposite to each other followed by placement of infusion cannula.

TOP RIGHT- After both the flaps are made, the cornea is marked with a marking pen at the centre of the corneal dome and an 8.5-mm blunt trephine is used to mark the area concentric to this mark to facilitate in Descemet scoring and stripping.

BOTTOM LEFT- After Descemet scoring, the Descemet is being stripped with a reverse Sinskey hook.

BOTTOM RIGHT- The IOL is held with McPherson forceps and inserted through the scleral incision. The leading haptic is grasped with a microcapsulorhexis forceps.
A small amount of viscoelastic is placed on the endothelial surface of the donor corneal disc. The donor corneal disc is then introduced into the anterior chamber (Fig 3 C) using a taco-fold technique using a forceps or inserted using a surgical glide or an inserter in its unfolded, or partially-folded, state (Fig 3 D). Once within the anterior chamber, the donor disc is attached to the recipient's inner corneal stroma using a large air bubble (Fig 4). The donor-recipient interface is formed between donor and recipient corneal stroma. The donor disc is then centred to the recipient cornea using the pre-placed epithelial circular mark. About 10 minutes is allowed to elapse to facilitate initial donor recipient corneal disc adherence. Postoperatively, the patient is asked to lay flat in the recovery room for about an hour and also to lay flat for the most part during the first post-operative day.

**FIGURE 3-DSEK WITH GLUED IOL**

A - The trailing haptic is exteriorized via the sclerotomy.

B - The trailing haptic is tucked into the intrascleral lamellar pocket.

C - The donor lenticule is inserted into the eye.

D - The donor lenticule is unfolded with saline injection and adjusted
Air is injected into the AC to fix the donor lenticule. Fibrin glue is used to seal the scleral flaps.

**FIGURE 4**

**DSAEEK**

DSAEEK with glued IOL as a procedure has been documented to be very effective in a recently concluded study by Sinha et al.\(^8,9\)

The surgical steps in DSAEK are similar to those described above for the recipient cornea. However, the donor corneal dissection is changed from a manual approach to an automated, microkeratome-assisted procedure. Hence, the stromal interface is improved in DSAEK as compared to DSEK. This improved donor-recipient interface is thought to contribute to improved quality of vision in DSAEK. Surgeon preparation of donor tissue does allow for some degree of changes in the parameters of the donor tissue in the operating room and decreases the overall cost of the procedure.
FEMTO-ASSISTED DSAEK-

Donor Lenticule Preparation:
AU7 Freshly prepared corneoscleral button is mounted on Barron artificial anterior chamber (Katena Product, Inc, Denville, NJ), making sure the centration is good and the AU8 chamber is filled with viscoelastic. After ensuring an adequate and watertight assembly, the assembly is docked with the Intralase applanation cone attached to the laser delivery system. No suction ring is placed. The laser pass is performed in the 60-kHz Intralase–enabled keratoplasty mode. The sequence followed is as follows: posterior side cut. full lamellar pass. anterior side cut. The depth of the lamellar cut is calculated as to ensure a 180-mm posterior lenticule. This is based on direct subtraction from the measurement (just before corneoscleral rim creation) on whole globe corneal pachymetry on anterior segment optical coherence tomography (Visante; Carl Zeiss Meditec, Dublin, CA). After the laser pass, the undissected cornea on the artificial chamber is shifted to the operating room from the femtosecond laser room. It is dissected and repositioned in the operating room. A 10-0 monofilament nylon suture is passed through the periphery of the lenticule from stromal to endothelial direction to help in unfolding and adjustment of the lenticule later (See Video, Supplemental Digital Content 1, http://links.lww.com/ICO/A8).

COMPLICATIONS OF DSEK/DSAEK

Flattening of anterior chamber:
It can occur with excessive air injection with retro-iris air bubble formation and flattening of the anterior chamber. This can be reversed by sterile balanced salt (BSS) injection into the anterior chamber. It is important to perform an inferior, peripheral iridectomy to avoid air-bubble associated angle closure post-operatively.

Decentration of the donor disc:
In cases of decentration of the donor disc, this should be corrected intra-operatively by gentle, exterior corneal massage as needed or by using a reverse Sinsky hook to reposition the donor corneal disc. Venting corneal incisions are usually not necessary to perform into the donor-recipient corneal interface. Post-operative donor disc detachment can be reattached with repeat air-injection with the usual intraoperative sterile precautions.

Retention of interface fluid:
If there is retention of interface fluid that is loculated, allowing time for fluid resorption is the correct option. But, if there is an open communication of aqueous from the interface to the anterior chamber, repeat air injection may be the only choice in most cases to seal and reattach the donor corneal disc to the recipient inner corneal stroma.

Iatrogenic graft failure:
Although new inserter devices have reduced the rates of graft failure; still it cannot be ruled out.
DESCEMET’S MEMBRANE ENDOTHELIAL KERATOPLASTY (DMEK) WITH GLUED IOL:

“DMEK” is the latest iteration of endothelial keratoplasty and is the latest innovation in minimally invasive corneal transplantation. It replaces only Descemet’s membrane and endothelium, and leaves the patient’s cornea closer to its original condition than any other transplant technique. It involves transplanting a delicate sheet of corneal cells 1/100 mm thick, which is 10 times thinner than what was previously required. In patients with compromised endothelium (Fig 5 A) it has a tremendous potential for faster recovery.

The recipient corneal dissection in DMEK is similar to the above two procedures, resulting in the exposure of the patient’s uncut inner corneal stroma. An inferior peripheral iridectomy is performed as in DSEK and DSAEK procedures. The donor Descemet's membrane is scored, partially detached under fluid, and trephined from the endothelial side. A Sinskey's hook is used to lift up the edge of the cut Descemet's membrane. Once an adequate edge is lifted, a non-toothed forceps is used to gently grab the Descemet's membrane at its very edge graft (Fig 5 B) is separated from the underlying stroma in a capsulorhexis-like circumferential manner. The Descemet's membrane with the healthy donor corneal endothelium is removed as a single donor disc without any donor corneal stroma. Hence, there is no need for an artificial anterior chamber or a microkeratome in the donor tissue preparation. This donor Descemet's membrane/endothelial complex is stained with a vital dye such as trypan blue for visualization.

An anterior chamber maintainer is introduced and all the steps of glued IOL surgery are followed consecutively beginning from 180 degree opposite scleral marking to the externalization and tucking of haptics (Fig 5 C, D).
FIGURE 5- DMEK WITH GLUED IOL

A- Preop Pseudophakic Bullous keratopathy. Note: PC (posterior chamber) IOL implanted in the AC

B- Descemet's membrane endothelial keratoplasty (DMEK) graft being prepared

C- PC IOL implanted in AC leading to corneal decompensation. The same PCIOL is being relocated into the posterior chamber using a closed globe glued IOL technique. The haptic is grabbed from over the iris using a glued IOL forceps and with handshake technique is transferred between the two hands till the tip of the haptic is held.

D- The haptic is exteriorized through the sclerotomy made under the scleral flap. The same procedure is followed for the second haptic too which is exteriorized through a sclerotomy under a second scleral flap created 180° away from the first. Each haptic is then tucked into a scleral tunnel created at the edge of the scleral flap.

E- The DMEK graft loaded in a Staar ICL injector is injected into the anterior chamber.

F- The DMEK graft is unrolled and an air bubble is used to appose it against the overlying stroma.

The graft is then carefully loaded into a Staar ICL injector (Fig 5 E) with the cartridge tip held occluded with a finger. It is then injected gently into the anterior chamber by plunging the soft tipped injector, taking care not to fold the graft. Wound assisted implantation is avoided and the AC maintainer flow is titrated carefully to prevent backflow and extrusion of the graft through the incision. The default shape of the donor disc is a coiled circular tube. This donor disc is then uncoiled using fluidics and the surgeon must avoid for the most part any direct instrument contact to the donor endothelium. Proper orientation is essential prior to attaching the donor Descemet's membrane to the exposed recipient bare corneal stroma. The graft orientation is then checked and it is unfolded gently using a small air-bubble as described by Melles. Once unfolded, an adequately tight air bubble is injected under the graft to float it up against the stroma (Fig 5 F). Fibrin glue is finally used to seal the lamellar scleral flaps, conjunctiva and the clear corneal incisions.

COMPLICATIONS OF DMEK-

Inability to harvest a viable graft:

Dr. Art Geibel described harvesting the graft manually under “water” utilizing his “SCUBA” technique. But never the less; a back-up cornea for DSAEK should be kept available as it can be used if the harvest is unsuccessful.

Poor adherence of the graft postoperatively:
Postoperative detachments are usually partial and they can be managed with repeat air injections. Make sure that the Descement's membrane is properly
oriented before injecting air into the anterior chamber for Descemet's membrane attachment. Also, confirm that the tip of the cannula is between the unrolled DM and the iris before injecting air to attach the DM to patient's cornea. If there is any post-operative Descemet's membrane separation, re-inject air into the anterior chamber to attach the Descemet's membrane to the patient's cornea.

**PENETRATING KERATOPLASTY WITH GLUED IOL:**

The donor tissue is prepared using a manual trephine from a freshly prepared cornoescleral button by punching on a Teflon block. The scleral flaps and the scleral pockets are created before the PK procedure is begun followed by sclerotomy with a 20 G needle. This ensures adequate globe tautness before the eye is completely opened up.

The host cornea is trephined and a 3-piece IOL is held at the pupillary plane. The leading haptic is externalized from the left sclerotomy site followed by the externalization of the trailing haptic from the right sclerotomy site. The haptics are tucked in the scleral pockets followed by suturing of the donor lenticule on the host tissue. The reconstituted fibrin glued is injected under the sclera flaps followed by application of local pressure for appx 10-15 seconds to allow the firm adhesion between the flap and the scleral bed.

**FEMTO ASSISTED KERATOPLASTY WITH GLUED IOL:**

Femtosecond laser assisted PKP with AC IOL explantation and glued IOL (Fig 6, 7, 8, 9) has been performed by us and has been documented in peer reviewed journal.10
FIGURE 6- FEMTOSECOND ASSISTED PENETRATING KERATOPLASTY WITH GLUED IOL

Top Left - Preoperative photograph showing Pseudophakic bullous keratopathy (PBK) with an AC IOL in situ.

Top Right - Femtosecond laser–created top-hat configuration.

Bottom Left - Femtosecond–assisted top-hat configuration showing the predictable and uniform wound formation.

Bottom Right - Inferior straight sclerotomy made with a 20-gauge needle 1.5 mm from the limbus under the existing scleral flaps. Note the diametrically opposite scleral flaps.

FIGURE 7-

Top Left - Augmentation of the top-hat configuration in areas that had poor laser penetration because of overlying opacity.

Top Right - Posterior uncut tissue dissected with a Vannas scissors.

Bottom Left - Explantation of an AC IOL after removal of the host button.

Bottom Right - Leading haptic grasped with the microcapsulorhexis forceps for being pulled through the inferior sclerotomy following the haptic curve.
FIGURE 8-

**Top Left**- Leading haptic externalized completely under the inferior scleral flap.

**Top Right**- The trailing haptic externalized through the superior sclerotomy under the scleral flap.

**Bottom Left**- The graft button placed and cardinal sutures applied.

**Bottom Right**- Scleral tunnel created along the curve of the externalized haptic in the superonasal area at the edge of the scleral bed of the flap.

The creation of the donor and host corneal button is achieved with femtosecond laser. Donor buttons are prepared from whole globes; after application of the suction ring. Adequate vacuum and centration is achieved and a top-hat configuration is created using a femtosecond laser (IntraLase FS [IntraLase Corp.]) For the host cut, topical anaesthetic agent is instilled into the patient’s eye. The suction ring is similarly applied and after adequate vacuum and centration, a top-hat configuration is created.

The donor corneal tissue and patient are then shifted to the keratoplasty operating room and the rest of the surgery is performed under peribulbar anaesthesia. As previously explained two partial scleral thickness flaps are made followed by sclerotomy. The top hat is inspected for completeness. After the host button is removed; limited open-sky anterior vitrectomy is performed.
FIGURE 9

Top Left- The superior haptic tucked into the superonasal tunnel.

Top Right- The tucking shown at higher magnification.

Bottom Left- Reconstituted fibrin glue injected through the cannula of the syringe delivery system under the inferior scleral flap.

Bottom Right- The glue applied at the graft–host junction.

The haptics are then externalized followed by tucking in the scleral pockets. The graft is placed and cardinal sutures are applied. The reconstituted fibrin glue is injected through the cannula of the syringe delivery system under both the scleral flaps. The same glue can be applied in the area between the sutures at the entire graft–host junction. The conjunctiva is also apposed with the glue.

BOSTON K- PRO WITH GLUED IOL-

A keratoprosthetic device is intended to provide a transparent optical pathway through an opacified cornea, in an eye which is not a reasonable candidate for a corneal transplant. Boston K-pro is a permanent keratoprosthetic device that has been proposed for individuals when attempts at corneal transplant have failed.
Keratoprosthetic devices differ in design but basically consist of a special tube that acts as a visualization channel that is anchored to the front surface of the cornea. Implantation techniques differ, and success rates are variable and highly dependent on the skill of the surgeon.

The device is available in two formats – Type 1 and Type 2. The type I Boston K-Pro is available in either a single standard pseudophakic plano power or customized aphakic powers (based on axial length) with adult (8.5 mm diameter) and paediatric (7.0 mm diameter) sized back plates. The type 2 format is similar to Type-1 format but is reserved for severe end-stage ocular surface disease desiccation that requires a permanent tarsorrhaphy to be performed through which a small anterior nub of the type II model protrudes.

The primary keratoprosthesis surgery is often combined with other procedures including iridoplasty, glaucoma filtration devices, IOL and lens capsule removal and core vitrectomy. Boston K-Pro has its own set of indications where it can be applied and when coupled with Glued IOL, the indications become more constrained. Any condition associated with secondary IOL implantation and where Boston k-Pro is the only indication; a combined procedure can be considered.

**INDICATIONS:**

The Boston K-Pro is a proven primary treatment option for-

- repeat graft failure herpetic keratitis
- paediatric congenital corneal opacities including Peter’s anomaly
- cicatrizing conditions including *Stevens–Johnson syndrome*, ocular cicatricial pemphigoid and also severe ocular burns
- Failed corneal graft with poor prognosis for further grafting
- Vision less than 20/200 in the affected eye and compromised vision in the opposite eye

The following are the pre-requisites for the surgery-

- No end-stage glaucoma or retinal detachment
- Easy access to hospital and/or healthcare team
- Commitment of the patient for a regular follow-up schedule

**TECHNIQUE-**

The keratoprosthesis is assembled by creating a sandwich composed of the K-Pro front plate, the donor cornea, and the K-Pro backplate that is secured with a locking ring. A donor cornea is trephined to create an 8.75-mm button with a central 3-mm opening. This tissue is then inserted between the front plate of the keratoprosthesis (with optical cylinder passing through the centre 3-mm opening) and the fenestrated back plate. The back plate is tightened in nut-and-bolt fashion and a locking titanium ring is applied.
Before the host cornea is trephined, two partial scleral thickness flaps are created as in a glued IOL surgery followed by sclerotomy and creation of scleral pockets.

The host cornea is then trephined and cut followed by open sky vitrectomy. The haptics of a 3-piece iol are externalized from the sclerotomy sites and tucked. The assembled device is inserted in an 8.0-mm recipient bed and sutured in standard fashion with 9.0 nylon. A bandage contact lens is placed. The scleral flaps are then adhered to the base by application of fibrin tissue glue.

**POSTOPERATIVE REGIME**-

1. Indefinite placement of a bandage contact lens is needed to maintain adequate ocular surface hydration and prevent stromal melt, dellen formation, tissue melt and necrosis.
2. Daily topical antibiotic prophylaxis
3. Lifelong topical steroids

**POSTOPERATIVE COMPLICATIONS**-

Most common postoperative complications include retro-prosthetic membrane (RPM), elevated intraocular pressure, infectious endophthalmitis and vitritis. Retinal detachment and vitreous haemorrhage are rarely seen.

**PROGNOSIS**-

Preoperative condition of the eye influences the clinical outcome after K-Pro surgery. The most favourable outcomes are achieved in non-cicatrizing conditions, followed by ocular burns and OCP with the worst outcomes in SJS patients. In patients with severe neurotrophic keratopathy, traditional penetrating keratoplasty is fraught with problems, including poor epithelial healing and corneal ulceration. The Boston K-Pro can provide rapid visual rehabilitation, despite corneal anaesthesia in these patients, and is currently our treatment of choice as a primary procedure for HZO patients who need corneal transplantation.

**DEEP ANTERIOR LAMELLAR KERATOPLASTY (DALK) WITH GLUED IOL:**

Glued IOL in the association with DALK raises different concerns from those associated with EK. Simultaneous surgery increases the difficulty of the DALK dissection due to altered visualization and decreased chamber stability due to the fresh incisions which renders the trephination process also very difficult. For these reasons, we believe that Glued IOL surgery either before or after DALK is preferable.
To conclude, Glued IOL surgery combined with corneal procedures is a viable option although surgical expertise is required for availing the maximum benefit of the combined procedure.

REFERENCES:


