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CORNEA

New DSEK instrumentation

by Michael W. Belin, M.D.

Simplifying the procedure and eliminating the need for an anterior chamber maintainer

Descemet's stripping endothelial keratoplasty (DSEK) has rivaled, if not surpassed, full-thickness PK for endothelial replacement surgery. There remains, however, a steep learning curve. Initial surgeries have been associated with higher rates of complications such as primary donor failure and dislocations. While DSEK has advantages over PK, including the retention of a more normal corneal topography, substantially less post-op astigmatism, a more rapid visual and structural rehabilitation, greater corneal integrity, and the avoidance of inherent risks associated with an open-sky procedure, the surgical manipulations required for a successful DSEK can, at times, appear daunting.

Figure 1. The NCI utilizes a flexible plastic platform in an irrigating device to roll the donor cornea to allow easier and less traumatic insertion during DSEK. The metal slide retracts and extends the flexible plastic platform

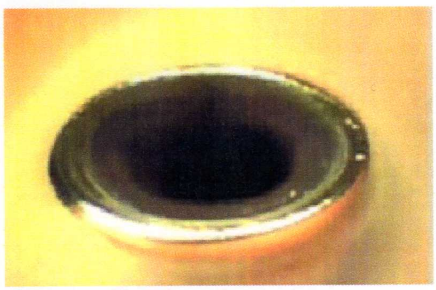

Figure 2. The donor cornea adheres to the platform by capillary action and rolls gently when the platform/tissue is retracted into the NCI barrel. The inner dimensions of the NCI allow for donor lenticules up to 8.75 mm to roll without any tissue overlap

Current donor insertion techniques involve tissue folding and forcep insertion, tissue folding and the use of an insertion platform (e.g. Rosenwasser donor insertion shovel, Katena, Denville, N.J.), tissue rolling with a secondary forcep "grab" technique (e.g. Busin glide spatula, Moria, Antony, France), or a suture or instrument pull-through technique. Regardless of technique, each requires some form of secondary irrigation (e.g. anterior chamber maintainer) during insertion to maintain adequate anterior chamber depth and to assist in the unfolding of the donor tissue. Additionally, most surgeons utilize either a non-dispersive viscoeleastic or an anterior chamber maintainer during the initial Descemet's scoring and stripping.

Recently a new donor inserter was introduced by Fischer Surgical (Imperial, Mo.), the Neusidl Corneal Inserter (NCI), model 9288 (Figure 1).

The inserter was designed to simplify the procedure and ease the transition by reducing the difficulties often associated with other insertion techniques and instruments. The NCI was designed as a self-sealing,

irrigating inserter that allows for gentle rolling of the donor lenticule without any tissue overlap. The tissue remains protected from compression during insertion and the anterior chamber remains deep (secondary to the incorporated irrigation), simplifying tissue delivery and obviating the need for a secondary irrigation source. Because the tissue is not folded, the unrolling occurs without the risk of the tissue being delivered upside down. Tissue manipulation is minimized and most procedures can be performed without any additional intraocular manipulation or instrumentation.

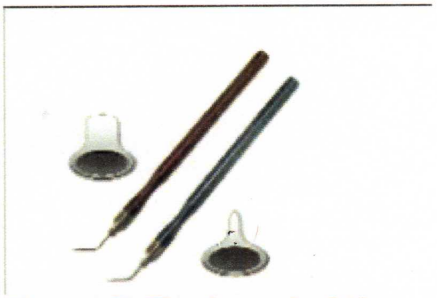

Figure 3. The barrel of the Belin oval irrigating scorer and stripper is designed to allow for a better wound seal and minimize wound leakage. Both instruments may be used with viscoelastics (without hooking up irrigation) or with irrigation to eliminate the need for viscoelatics

Unlike phacoemusification, high flow and turbulence in the anterior chamber is not desired. Optimally the anterior chamber should remain deep during tissue insertion with minimal flow. This requires a tight seal around the irrigating inserter. One of the unique properties of the NCI is the oval design (Figure 2), which allows for a better seal with either a clear corneal incision or a scleral tunnel, without the wound gaping often seen with round instruments.

The NCI has greatly simplified the DSEK procedure. While donor insertion could be performed without ancillary irrigation, most surgeons use either viscoelastics, an anterior chamber maintainer, or an irrigating instrument for Descemet's scoring and stripping. Viscoelastics add significantly to the overall cost of the procedure and should be avoided in eyes without an intact posterior capsule. Current irrigating instruments are typically round with poor sealing capabilities. The newly designed Belin oval irrigating DSEK scoring hook and Belin oval irrigating DSEK stripper, model 8909, 8908, or 8912 (set) (Fischer Surgical) (Figure 3), were designed after observing the excellent wound seal obtained with the NCI.

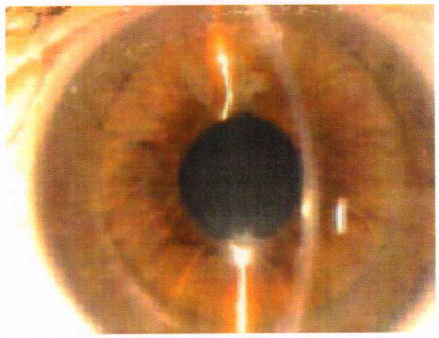

Figure 4a & 4b. One week post-DSEK showing excellent corneal clarity and the absence of donor tissue folds. The Scheimpflug image taken at the same time demonstrates early corneal deturgescence. Visual acuity at one week was 20/40+

The combination of the Belin oval irrigating instruments combined with the NCI allows the entire DSEK procedure to be performed with minimal or no viscoelastics. The procedure does not require the use of an anterior chamber maintainer and is typically performed without extensive intraocular tissue manipulation.

Scleral tunnel DSEK surgical technique using the NCI folding spatula and Belin irrigating scorer and stripper

1. Perform a conjunctival peritomy superiorly between the 10 o'clock and 2 o'clock positions (or temporally). Remove any remaining tenons and obtain hemostasis with wet-field cautery as needed.
2. Using a caliper, measure and mark a 5.2 mm length corneal incision 1.0 to 1.5 mm posterior to the limbus. A 5.2 mm incision length allows for an external watertight seal when the NCI is inserted.
3. Using a 69 beaver, a diamond micrometer blade set at 200 microns, or similar device, make a 5.2 mm long partial thickness sclera incision. Then, using an angled crescent blade, create a partial thickness scleral dissection (tunnel) carried into clear cornea without entering the anterior chamber.
4. Using a blunt 8.0 mm trephine (other sizes may be used), mark the anterior cornea. This will serve as your guide for stripping Descemet's.
5. Make a peripheral paracentesis. Depending on the eye (OD/OS) and the orbital anatomy, the paracentesis should allow for easy access into the anterior chamber if required. Through the sclera tunnel, enter the anterior chamber using a 1.5 mm slit blade.
6. Attach the irrigation tubing to the Belin oval irrigating scoring hook and gently outline Descemet's membrane using the marked cornea as a guide. Attach the Belin oval irrigating stripper and remove Descemet's membrane. The stripper is designed with a small edge to facilitate stripping. Adjust bottle height to maintain the anterior chamber depth.
7. Enlarge the scleral tunnel opening to the full 5.2 mm length externally and approximately 5.5 mm internally.
8. Inspect the NCI folding spatula. Retract and then extend the platform to make sure it functions smoothly and the platform rolls properly into position. Leave the platform fully extended and connect the other end of the NCI to a standard irrigation line connected to BSS Plus (Alcon, Forth Worth, Texas) or similar product. Position the irrigation bottle slightly above the patient's eye and open the irrigation to remove all the bubbles in the system (the bottle may be temporally raised to speed this process). Adjust the bottle height just slightly above the position of the eye. This will typically allow for approximately 1 gtt per second; then turn off the irrigation.
9. Prepare the donor cornea in the usual fashion. Pre-cut tissue is recommended, if possible, as it appears to offer better consistency. Punch the donor button to create an 8.0 mm endothelial/posterior stroma donor lenticule. It is optional, but staining the button with trypan blue makes subsequent visualization easier.
10. Dry the NCI platform and place the donor lenticule endothelial side up on the dry platform. Center the donor cornea onto the platform. The donor should not overhang the leading surface of the platform. Slowly retract the platform/donor cornea, observing that the platform and donor cornea rolls smoothly into the barrel of the NCI.
11. Turn the irrigation back on. The irrigation should have minimal flow (just enough to fill the lines and barrel and prevent any backflow).
12. Turn the NCI over. This properly orients the donor cornea endothelial side down. Then insert the NCI into the sclera tunnel. The NCI should fit tightly but should not require excessive force. Advance the NCI while having the OR technician raise the height of the irrigation bottle to maintain a deep anterior chamber. Advance the NCI to the end of the tunnel (there is a stop or raised edge on the NCI that limits the insertion depth). The bottle height is raised to typical phaco levels and adjusted to maintain a deep chamber.
13. Slowly extend the platform/donor lenticule and observe the unrolling

of the donor button (the trypan blue stained edges makes this easier). The button will often spontaneously dislodge or may require gentle rocking of the NCI. The button will unroll and dislodge easier in a deep chamber, and if needed the bottle height may be raised. (It is rarely necessary to use a secondary instrument to dislodge the button.)
14. The button should be unrolled and properly oriented. Retract the platform and remove the NCI from the eye.
15. Close the sclera tunnel using three to four interrupted 10-0 nylon sutures and partially reform the anterior chamber with BSS.
16. At this point proceed with positioning the donor button and injecting air in your usual fashion. The entire procedure has been performed without the use of viscoelastics and with minimal tissue manipulation allowing for excellent tissue adhesion.
In my practice, the NCI combined with the oval irrigating scorer and stripper has greatly simplified DSEK, minimized the cost associated with the use of viscoelastics, lowered the dislocation rate, and appears to be associated with a more rapid return of visual acuity (Figures 4a and 4b).

ABOUT THE AUTHOR

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