Symmetrical Marking of Both Donor and Recipient Corneas in Penetrating Keratoplasty

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Abstract. The symmetrical marking of both the donor and the recipient corneas aids in the proper alignment of the donor cornea within the recipient opening. The second stitch in a penetrating keratoplasty is the most important stitch for the proper alignment of the donor cornea within the recipient opening. If the second stitch is placed too far to the right or left, there will be a gap on one side and an override on the other side. This misalignment is likely to result in a distortion of the corneal surface contour. The proper alignment can be made even more difficult if the recipient opening is distorted. The proper alignment can be facilitated by symmetrically marking both donor and recipient corneas. A simple surgical technique is described to clarify and emphasize this very important principle of penetrating keratoplasty—the alignment of the donor cornea within the recipient opening. [Ophthalmic Surg Lasers 1997;28:338–342.]

The ophthalmic literature is very sparse concerning the basic principles of proper alignment of the donor cornea within the recipient opening of penetrating keratoplasties. In 1966, Castroviejo described a three-pronged marker for correct placement of direct marginal sutures in circular grafts (Fig. 1).1 This device, used on both the recipient cornea and the whole donor globe, was never commonly used. Castroviejo also described a technique in 1966 that is still used to attempt proper alignment of the donor cornea in the recipient opening (Fig. 2).2 The second needle is left in place after it has been passed through both the donor and the recipient corneas. Castroviejo reports, "If lateral nasal or temporal displacement of the graft is noted, the position of the needle is adjusted in the desired direction [as shown by the arrows in Figure 2, A and C] until the graft is properly placed."2

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This technique can be difficult in certain situations, such as collapse of the recipient corneal rim, inability to reestablish the globe contour, or derangement of the anterior globe segment. Gorovoy and Stern described a technique using an eight-blade radial keratotomy (RK) marker for the recipient cornea and a C-Ring to aid in the proper alignment of the first four cardinal stitches of the donor with the recipient cornea. In 1987, Gilbard, Rothman, and Kenyon advanced the instrumentation by designing a new vacuum punch trephine that marks the donor corneal surface. This was combined with independently marking the recipient corneal surface with a modified RK marker and cutting the recipient cornea with a Hessburg-Barron vacuum trephine. Recently designed are a few trephines that attempt to mark both the recipient and the donor corneal surfaces; however, the importance of the basic surgical principle of properly aligning the donor cornea within the recipient opening has not been reemphasized in the recent ophthalmic literature.

Symmetrical marking of both donor and recipient corneas in penetrating keratoplasty can facilitate proper alignment, especially if there is distortion of the recipient opening. Although most corneal surgeons make careful observations and adjustments for alignment, few have adopted a technique to symmetrically mark both the donor and the recipient corneas to aid in this important alignment.

The technique described in this presentation is only one of several possible techniques, but it serves to underscore the basic principle of proper alignment of the donor cornea within the recipient opening, which must always be carefully considered in any penetrating keratoplasty technique.

**OPERATIVE TECHNIQUE**

Many corneal surgeons have marked the recipient cornea for years. The disposable Barron Radial Vacuum Trephine (Katena, Denville, NJ) with crosshairs is ideal for this technique. The 16 radial impressions, made by trephine suction, will become visible when the corneal surface is dried with a cellulose sponge. Every other impression is marked with a gentian violet surgical pen, producing eight symmetrical peripheral marks (Fig. 3). If a scleral fixation ring or a needle to hold the intraocular lens posteriorly is to be used, always apply these devices after the eight symmetrical peripheral marks of the recipient cornea have been made. These devices may distort the corneal contour and thus result in incorrect marking.

Any donor trephine can be used for this technique, although the disposable Barron Vacuum Donor Cornea Punch (Katena) works well. The vacuum component significantly decreases slippage of the donor cornea when cutting.

The donor cornea is placed on the back flat surface of the seating ring housing with the endothelial side down. The endothelium does not touch the surface because of the dome curve of the cornea and the rigidity of the tissue. The donor epithelial surface is dried with a cellulose sponge to prevent “bleeding” of the gentian violet marks. Any loose epithelium is removed. The anatomic center of the donor cornea, or the center where the donor cornea is to be excised, is measured with calipers and marked with a gentian violet pen. An eight-blade RK marker, dyed with gentian violet, is aligned with the mark and pressed lightly onto the dried epithelial surface (Figs. 4 and 5). A 4-0 Mersilene (Ethicon, Sommerville, NJ) suture, impregnated with gentian violet, is used to extend the marks centrally to establish the true center of the eight radial marks (Figs. 6 and 7). The donor cornea, with the endothelial surface up, is placed in the well of the cutting block such that the cross marks of the donor cornea align exactly with the center hole of the cutting block (Fig. 8). The seating ring housing is gently pressed down and the plunger of the syringe is abruptly released. When suction is established, the seating ring housing is removed and it is confirmed that the donor cornea has remained in the proper position. The trephine blade housing is inserted into the cutting block. The trephine blade is firmly pressed down with even pressure on all four corners. The trephine blade is
removed, the corneal storage medium is placed on the endothelial surface (Fig. 9), and the cornea is protected with a cover (seating housing).

Once the recipient cornea is excised and is prepared to receive the donor cornea, the donor cornea is placed in the recipient opening. Double-toothed forceps grasp the anterior edge of the donor cornea, straddling one of the donor radial marks. The needle is passed radially through the donor cornea. The forceps are released, and the needle with the donor cornea is lifted to determine the true orientation of the needle (Fig. 10). It should be radial. The radial marks on the donor surface aid in this visualization. The needle is then passed through the recipient cornea directly under .12-mm toothed forceps and in line with the recipient peripheral mark. The needle holder is released to make sure the needle is aligned radially. This first stitch is tied with the appropriate tension.

The second stitch is now placed 180° from the first stitch. The second stitch is the most important stitch for the proper alignment of the donor cornea in
Figure 9. The donor cornea is cut with eight symmetrical marks on the epithelial surface. Corneal storage medium is placed on the endothelial surface.

Figure 10. The forceps are released, and the needle with the donor cornea is lifted to determine the true orientation of the needle. It should be radial. The radial marks on the donor surface aid in this visualization.

Figure 11. The needle of the second stitch is passed directly under the .12-mm toothed forceps in line with the radial mark of the donor cornea. The needle holder is released to determine if the needle has been passed radially through the donor cornea.

Figure 12. If the second stitch is placed too far to the right or left, there will be a gap on one side and an override on the other.

Figure 13. The needle is passed through the recipient tissue directly under the forceps in a radial line with the recipient peripheral mark. The needle is left in place, and the surface globe contour is reestablished with intraocular air. The alignment of the donor cornea within the recipient opening is carefully checked. The needle opening.

The needle is passed directly under the .12-mm toothed forceps in line with the radial mark of the donor cornea. The needle holder is released to determine if the needle has been passed radially through the donor cornea. If the second stitch is placed too far to the right or left, there will be a gap on one side and an override on the other (Fig. 12). The needle is passed through the recipient tissue directly under the forceps in a radial line with the recipient peripheral mark. The needle is left in place, and the surface globe contour is reestablished with intraocular air. The alignment of the donor cornea within the recipient opening is carefully checked (Fig. 13). The second stitch is tied with the appropriate tension.

The third and fourth interrupted stitches are placed 90° from the first two interrupted stitches in
the same manner, establishing the four cardinal interrupted stitches (Fig. 14). If the symmetrical marks are properly placed on both the donor and the recipient corneas and the first four interrupted stitches are properly positioned, the donor cornea will be symmetrically secured within the recipient opening.

After the first four interrupted cardinal stitches are in place, the surgeon can proceed with any further stitch technique preferred. The symmetrical marks on both the donor and the recipient corneas will continue to provide good visual aids for passing interrupted stitches symmetrically and radially as well as for placing a continuous running stitch symmetrically (Fig. 15).

DISCUSSION

Symmetrical marking of both donor and recipient corneas is a simple facilitating technique for an important, yet basic principle of penetrating keratoplasty—the alignment of the donor cornea within the recipient opening. This is only one of many possible surgical techniques. While there will always be newer techniques and instrumentation to improve the surgeon's ability to consistently achieve the basic principles of penetrating keratoplasty, the basic principle of proper alignment of the donor cornea within the recipient opening will always be important.

REFERENCES