

Antibiotic Prophylaxis for Clear Corneal Incisions

Injecting vancomycin into the corneal stroma after cataract surgery can reduce the risk of endophthalmitis.

BY J. E. "JAY" McDONALD II, MD

The ophthalmic literature contains conflicting reports on the link between clear corneal cataract surgery and an increased threat of endophthalmitis. Of all the potential complications associated with this technique, none has dulled my enthusiasm for its benefits more than the possibility of my patients' developing this serious postoperative infection.

A well-designed incision is important, but even the most carefully constructed wound can lose its ability to block the ingress of bacteria and debris from the eyelids into the eye if it is subjected to too much stress and strain intraoperatively. This article presents a technique for stromal hydration that I have found ensures that my clear corneal incisions are well sealed and protected from infection before my patients leave the OR.

FALSE SENSE OF SECURITY

Several years ago, soon after I converted to clear corneal incisions, a small series of my patients developed postoperative endophthalmitis that was positive for *Staphylococcus epidermidis*. I immediately reviewed every step of my operative procedure and evaluated my pre- and postoperative protocols. When I read cases of postoperative endophthalmitis reported in the literature, I learned that most of the infections were caused by organisms that originated

in the patients' normal ocular flora. The literature identified *S. epidermidis*, which often colonizes patients' eyelids and lid margins, as the most common causative agent of postoperative endophthalmitis.¹⁻³

Because I suspected that poor incisional integrity was allowing flora from my patients' eyelids and conjunctivae to enter their eyes after cataract surgery, I took measures to reduce or eliminate this risk factor. First, I transitioned

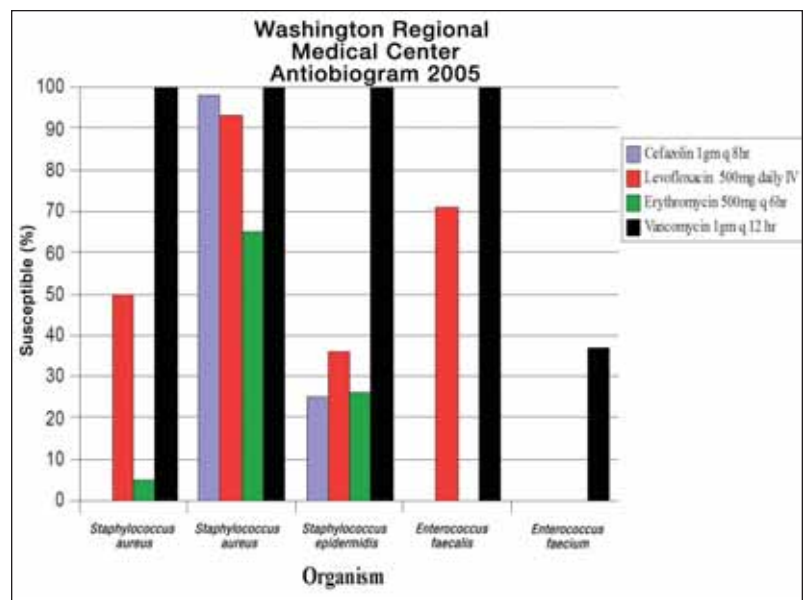


Figure 1. The author uses diluted vancomycin to seal clear corneal incisions based on the 2005 report on bacterial culture and sensitivity from the Washington Regional Medical Center in Fayetteville, Arkansas.

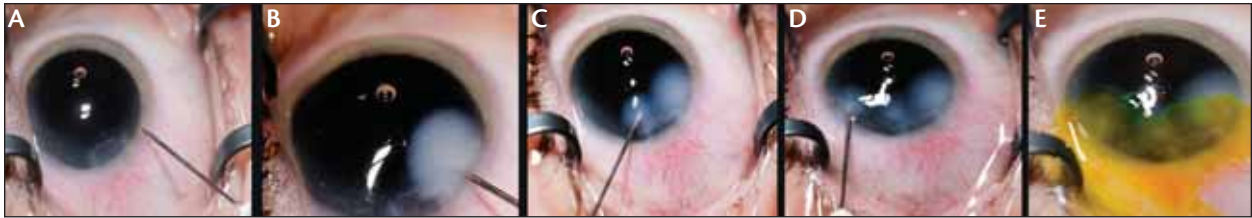


Figure 2. During stromal hydration with vancomycin (1 mg/0.1 mL), the author inserts a needle into the stroma just inside the limbus (A). The bevel is rotated toward the main incision and directed toward it at a 45° angle. Corneal fogging indicates that the vancomycin is entering the stroma (B). Direct injection seals the superior border of the main temporal injection (C). The paracentesis injection can be sealed with a separate injection (D). Fluorescein applied to the corneal surface reveals that both incisions are completely sealed (E).

from a trapezoidal transverse incision to a trapezoidal corneal plane incision. I also changed my preoperative protocol to include the application of bacitracin ointment and lid scrubs for 4 days before surgery. Previously, my patients used erythromycin ointment and performed lid scrubs for only 1 day preoperatively. Finally, I added a same-day examination to my postoperative regimen.

I was astonished to discover that 15% of the corneal wounds that seemed to be sealed at the conclusion of surgery were Seidel positive when I examined them 3 hours later. I realized that using fluorescein dye to check the wound's integrity immediately postoperatively had given me a false sense of security.

FINDING A SOLUTION

As I searched for alternative strategies for preventing endophthalmitis with clear corneal incisions, I learned about the *Wong way* incisional technique for stromal hydration through the ASCRS online cataract forum. This method for sealing the wound was developed by Michael Y. Wong, MD, a cataract surgeon from Princeton, New Jersey (see his article on page 71 of this issue). At the time, I was using a technique of direct hydration that swelled the wound but appeared to separate the collagen fibrils on either side of its opening. Dr. Wong injected fluid at the area of apposition, where it sealed the wound by exerting external forces on the opening. His technique made sense to me, because it fit my vision of forcing the woven collagen fibers lining the wound into tight apposition. I also wanted to control postoperative astigmatism, however, so I searched for an approach that would not transect the cornea's collagen fibers.

I began injecting diluted vancomycin into the paraincisional area through a 30-gauge needle on a tuberculin syringe. My goal was to seal the wound by increasing the pressure on its edges from the inside instead of the outside. I chose vancomycin because the local hospital's annual report on bacterial culture and sensitivity showed that the facility's endemic variants of *S. epidermidis* and

methicillin-resistant *Staphylococcus aureus* were susceptible to this antibiotic (Figure 1).

SEALING THE INCISION

I prepare vancomycin for corneal injection by diluting a 500-mg vial of the drug with balanced salt solution to a final concentration of 1 mg/0.1 mL. This is the same concentration of vancomycin that Howard Gimbel, MD, of Calgary, Alberta, Canada, routinely administers intracamerally at the conclusion of cataract surgery. I then aspirate an aliquot for each case from a 12-mL syringe containing the proper concentration of the solution with a tuberculin syringe.

I prepare the eye for stromal hydration by aspirating all of the viscoelastic and adjusting the IOP so that the globe is moderately soft. I then direct the syringe so that the needle enters the stroma inside the limbus on the same side of the sideport incision, 1 or 2 mm from the main temporal incision (Figure 2A). The bevel of the needle is rotated toward the main incision and directed at a 45° angle of the limbus, and the tip is advanced to just beyond the end of the incision. I inject the vancomycin slowly until the cornea takes on a foggy appearance (Figure 2B to 2D). This change indicates that the seal is going across the front of the incision.

Occasionally, the wound may be sufficiently loose to allow me to initiate the injection on the opposite side of the incision in order for the solution to dissect the remaining length of the incision. At the end of the procedure, I apply fluorescein to the cornea to ensure that the incision is completely sealed (Figure 2E).

LEARNING CURVE

Surgeons may feel awkward the first few times they try this technique, because the cornea resists the penetration of the needle and the ingress of the antibiotic solution. The curvature of the cornea means it is important to insert the needle at the proper angle so that it penetrates, but does not perforate the cornea.

The sensation I feel as the needle pierces the cornea is similar to when a needle breaks the skin during a

tuberculosis test. Once the needle penetrates the cornea, I use its tip to lift the cornea slightly. This action ensures that the needle will continue to travel in the stroma and will not perforate the cornea. Just as the goal of a tuberculosis test is to inject serum under the epidermis, the goal of the hydration procedure is to insert the needle under Bowman's membrane and inject the vancomycin solution into the corneal stroma.

In my experience, the amount of force needed to penetrate the cornea varies among eyes. It is also important to remember that the superficial cornea offers more resistance to penetration than the deep part and that one may have to adjust one's technique accordingly.

If the patient suddenly moves his eye toward the surgeon during the vancomycin's injection, the needle may inadvertently perforate the cornea and enter the anterior chamber. If this occurs, one should withdraw the needle and restart the procedure. The same strategy applies if Bowman's membrane becomes elevated or if Descemet's membrane moves away from the stroma during the injection. As long as Descemet's membrane remains attached at its perimeter, it will return to proper apposition as the vancomycin is absorbed by the eye. With a little practice, surgeons will become comfortable with the technique.

CONCLUSION

Every cataract procedure begins and ends with the incision. I believe that injecting vancomycin around the corneal incision not only seals the wound but also raises a barrier against organisms that can cause endophthalmitis after clear corneal cataract surgery.

Since I began using my vancomycin-fortified stromal hydration technique to seal clear corneal incisions, I have not seen a case of endophthalmitis. In addition, less than 1% of my clear corneal wounds are Seidel positive at 3 hours postoperatively. ■

To view a video of the procedure described in this article, visit Dr. McDonald's Web site at <http://www.mcdonaldeye.com/professionals>.

J. E. "Jay" McDonald II, MD, is Director of McDonald Eye Associates and Editor of the ASCRS Eye Mail. He may be reached at (479) 521-2555; mcdonaldje@mcdonaldeye.com.



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