ABSTRACT

BACKGROUND: Donor cornea contamination as a cause of endophthalmitis is one of the most serious complications of penetrating keratoplasty. Optisol-GS corneal storage medium with the combination of gentamicin and streptomycin was designed to provide wider antibiotic coverage, most notably against streptococcal species. However, many enterococci are resistant to streptomycin and gentamicin.

METHODS/RESULTS: We report a case in which Enterococcus faecium was isolated from cultures of the donor limbus prior to corneal excision and again from preoperative cultures of the donor corneal rim despite 5 days of preservation in Optisol-GS. The isolate was found to be resistant to both gentamicin and streptomycin.

CONCLUSIONS: This case illustrates the need to raise awareness that streptococcus can remain a viable contaminant of donor corneas despite storage in Optisol-GS medium. [J Refract Surg. 1995;11:207-209.]

Despite application of stringent prophylactic eye bank procedures in harvesting and preservation, donor cornea contamination as a cause of endophthalmitis remains a significant complication of penetrating keratoplasty.1-6 The majority of clinical endophthalmitis cases have been reported following intraocular surgery1,3,7-9; in 1992, Aiello et al reported the incidence of bacterial endophthalmitis after penetrating keratoplasty to be 0.8%.9,10 Optisol-GS (Chiron IntraOptics Inc, Irvine, Calif) is a corneal preservation medium that has combined streptomycin with gentamicin and is aimed at providing wider antibiotic coverage, most notably against streptococcal species. Reports of increasing numbers of donor corneas carrying gentamicin-resistant bacteria2,10-12 influenced its development. Seventy percent of enterococci are resistant to gentamicin and 25% to 55% of enterococci are resistant to streptomycin as well.13

In this report, we describe a case in which streptococci were isolated from cultures of the donor limbus prior to corneal excision and again from cultures of the corneal rim despite 5 days of preservation in Optisol-GS.

CASE REPORT

A 58-year-old donor died of alcoholic liver disease. Cultures of the donor’s peritoneal fluid and urine during the course of hospitalization were negative for bacterial growth, and no contraindications to transplant were present.14 The eyes were enucleated, and 5 mL of antibiotic solution containing Neomycin, Gramicidin, and Polymyxin B were immediately poured over the globes and retained during transport to the laboratory. The technician performed a thorough rinse of the eyes with sterile saline under a laminar flow hood. A sterile cotton swab was gently rolled around the limbus of each eye, and the tips were broken off into bottles of BHI (brain-heart infusion) broth and sent to the Oregon Health Sciences University microbiology laboratory for culturing at 37 degrees. The corneas were then excised and preserved in Optisol-GS corneal storage medium per Eye Bank Association of America standards.14 Death to corneal preservation time was 5 hours. The pH-sensitive color indicator in the medium remained in the normal range. Other viewing chambers containing Optisol-GS medium with the same lot number were free of contamination as evidenced by having no growth on preoperative cultures of corneas preserved in the media.

The next day, results of donor serum screens for Hepatitis B surface antigen, HIV-1/HIV-2 antibod-
ies, RPR, and Hepatitis C antibody were returned as nonreactive, and corneal transplant surgeries using the tissue were scheduled. One day prior to the scheduled surgery date, the laboratory provided a preliminary report of an isolate of gamma-streptococcus from both preexcision limbal cultures. The surgeries were canceled.

The Optisol-GS chambers were opened under a laminar flow hood using aseptic technique, and a second set of cultures of the donor corneal rims and media were obtained using the same technique as previously. The viewing chamber containing the cornea from the donor's right eye was allowed to warm to room temperature overnight prior to culturing, while the chamber holding the left cornea was cultured immediately after removal from storage at 4°C. The following day, gram-positive cocci in chains were isolated from the left corneal rim and medium culture. Cultures of the right donor cornea and medium were reported as having no growth. The final reports of the left and right preexcision limbal cultures and the postexcision cultures of the left corneal rim and its Optisol-GS medium identified the organism as Enterococcus faecium, moderately susceptible to vancomycin and resistant to gentamicin, streptomycin, ampicillin, and penicillin. The postexcision culture of the right corneal rim and its Optisol-GS medium, cultured at room temperature, had no growth.

DISCUSSION

Possible sources of contamination of donor tissue include donor eye flora, contamination during harvesting and preservation, or nonsterile storage medium. In this case, the source was most likely the donor.

Optisol-GS storage medium was designed to improve streptococcal coverage, and until now, there have been no reports of streptococci being resistant to the combination of gentamicin and streptomycin in Optisol-GS.

Although infections caused by gram-negative organisms are generally considered to be more fulminant than those caused by gram-positive organisms, streptococcal infections are an exception. In a recent study, 60% of patients with streptococcal endophthalmitis had visual acuity outcomes of less than 20/400, and three cases seen at our institution in recent years resulted in enucleation. In one reported series of streptococcal endophthalmitis, final visual acuity was hand motion or worse in 12 of 13 cases.

A series of 48 streptococcal endophthalmitis cases reported a prevalence of 27.1% enterococcal infections. Among the streptococci, enterococci carry the highest frequency of resistance to gentamicin. The antibiotic of choice for enterococcal infections is vancomycin alone or in combination with a third-generation cephalosporin. However, vancomycin is impractical as an additive to a storage medium because as a cell-wall synthesis disrupter, it requires actively growing microorganisms to be effective; it is also unstable at neutral pH, and has little antimicrobial activity at 4°C. As a result, the combination of gentamicin and streptomycin, although imperfect, is currently the best available combination of antibiotics for use in storage media. This combination does increase bacteriocidal activity when compared to gentamicin alone against staphylococcal and many streptococcal species. However, it is rarely effective against enterococci, specifically E. faecium. Clinicians should, therefore, not be lulled into believing that growth of streptococcal contaminants has been completely eliminated by this combined antibiotic medium.

Studies of antibiotics in corneal storage media have demonstrated increased effectiveness of bacteriocidal activity at room temperature (27°C) compared to that at 4°C. The negative culture of the donor rim and its Optisol-GS medium from the chamber, which had been kept at room temperature overnight prior to culturing, is consistent with this observation. However, because the organism cultured from both eyes prior to preservation in Optisol-GS medium was shown to be resistant to both gentamicin and streptomycin, a more plausible explanation is that there was a smaller inoculum of the organism on the right eye as compared to the left, and it was, therefore, not detected on subsequent post-preservation culture.

No specific antibiotic or combination of antibiotics is 100% effective in eliminating contaminants. Therefore, we stress that an aggressive decontamination procedure should be used to minimize the possibility of microbial growth. Currently, the most effective decontamination technique, one that is advocated by the Eye Bank Association of America and has recently been implemented in our own eye bank, is a postnucleation 3-minute immersion of the globe in 1% povidone iodine solution. Antiseptic techniques such as this will become increasingly important as bacterial resistance to antibiotics becomes more frequent.

By report of this case, in which streptococcus was isolated from a corneal rim that had been stored for 5 days in Optisol-GS medium, we seek to raise the level of awareness that one must not assume that the donor cornea is free from all streptococcal contamination solely because of storage in Optisol-GS medium.

REFERENCES