Editorial

Dangers of "Eye-to-Eye" Contact

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Corneal transplantation (or penetrating keratoplasty) restores sight to patients with corneal blindness. There are three major reasons why corneal transplant programs have become increasingly successful. First, the evaluation and processing of donor corneas by the more than 70 eye banks in the United States has increased the number of corneas available for transplantation. Second, improved procurement techniques and storage media have further increased the number of corneas suitable for transplantation and have improved donor viability. Third, improvements in surgical instruments and technique, combined with improved microsurgical training of ophthalmologists and postoperative management have improved the prognosis for individual cases. As a result, more than 30,000 corneal transplants a year are being performed in the United States.

Optimal characteristics of a donor cornea include adequacy of endothelial cell population and viability to ensure graft survival, and absence of potentially infectious agents to be transmitted to the recipient. Much attention has been paid to the transmission of infectious diseases by corneal transplantation. To date, only two viral diseases-rabies and Creutzfeldt-Jakob disease-have been documented to be transmitted by corneal transplantation.[1-3]

Recent investigators have isolated hepatitis B surface antigen from the washings of ocular tissue from corneal donors,[4] while others have isolated the human immunodeficiency virus from corneal tissue.[5-6] The importance of these observations is the possibility of transmitting a potentially fatal disease to the corneal transplant recipient. However, because isolation of these pathogens from donor material is currently such a rare event, the risk to the recipient of acquiring these diseases is currently unknown.

Bacterial contamination of donor corneas has been recognized for many years.[7] The use of irrigating solutions has decreased the numbers of prevalent conjunctival flora contamination. The most common conjunctival organisms include coagulase-negative staphylococci and diphtheroids. The incidence of contamination is estimated between 12.4% to 100% in the literature.[8] Contamination rate of the donor corneal rims grafted at the Massachusetts Eye and Ear Infirmary, which were provided by the New England Eye Bank in 1988, was 28% (unpublished data). Of the corneal transplants performed at our institution. one case of endophthalmitis after transplant caused by a group C, B-hemolytic streptococcus occurred.[9]

In the late 1970s, the McCarey-Kaufman corneal preservation medium was developed, initially including penicillin G 100 units/mL and streptomycin 100 units/mL. By storage at 4°C, corneas were successfully grafted up to four days after corneal retrieval. Substituting gentamicin for streptomycin has been reported to further reduce bacterial contamination during storage.[10,11] More recently new corneal preservation media have been developed that contain the antioxidant chondroitin sulfate, which further prolongs the viability of the endothelium, permitting storage for up to one week.

While improvements in storage media have been occurring, additional reports of endophthalmitis following corneal transplantation have appeared in the literature.[8,12-23] The incidence of endophthalmitis postkeratoplasty appears to be less than 1% .[8,18,24] However, the role of donor cornea contamination as a cause of endophthalmitis is not entirely clear for two reasons. First, if there is a lack of concordance between donor and recipient cultures, other possible sources of infection must be considered. Second, because 99% of patients who receive contaminated corneas do not develop endophthalmitis, the role of contamination is not well understood.

Moore et al (pp 102-105) report on a cluster of pneumococcal endophthalmitis cases following corneal transplantation and its control by modifications of corneal harvesting techniques.[25] Over a nine-month period, three cases of endophthalmitis occurring in 61 patients undergoing corneal transplanta-

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tion prompted an investigation into bacterial contamination of donor corneas. All three patients received corneas with donor rim cultures positive for S *pneumoniae*. Review of corneal rim cultures during the same period revealed 35% of the positive cultures were caused by S *pneumoniae* (6/17), compared with the previous twelve-month period when 5% of the positive cultures were caused by S *pneumoniae*. Unfortunately, vitreal cultures from the corneal rim recipients are not included to confirm that the bacterial cause of the endophthalmitis was indeed S *pneumoniae*, nor is the time period between the transplant and the diagnosis of endophthalmitis presented. Thus, although it is likely that the donor cornea bacterial contamination was related to the endophthalmitis, microbiological confirmation is lacking in this report.[26]

Moore et al then examined the possible reasons for the increase in contamination of donor corneas by S *pneumoniae*. Harvesting techniques revealed lack of additional irrigation with saline prior to irrigation of the donor eye with neosporin prior to removal of the cornea. This technique has been associated with decreased rates of bacterial contamination of harvested corneas in experimental situations.[27] Changes in the storage media and lower than recommended gentamicin level were identified during the study. Because the cases of corneal contamination by S *pneumoniae* were discovered during use of both types of storage media, it seems less likely that the media was the source of the infection.

The investigators also draw attention to the change in donors, noting an increase in younger individuals and proposing that the younger donors were a source of the pneumococci. Sugar and Liff[28] noted that patients under age 10 were less likely to yield contaminated corneal tissue than older patients. Because other changes in harvesting technique have eradicated the high incidence of donor corneas contaminated with S *pneumoniae*, this hypothesis seems less tenable. Further, elimination of younger donors would limit the supply of corneas available for transplantation.

Next, the investigators drew attention to the use of part-time technicians for harvesting of corneas, suggesting that their technique was less optimal and that this might have precipitated the epidemic. Unfortunately, there was no analysis by technician, but it is possible that the corneal contamination came from a specific technician.

Finally, the use of prophylactic antibiotics and/or irrigation of the recipient's eye prior to corneal transplant was not evaluated. Preoperative preparation of the field with half-strength (5%) iodine as well as prophylactic intravenous, subconjunctival, and/or topical antibiotics may also have a role in prevention of ocular infections posttransplant.[29]

Because the modified harvesting techniques included several changes, it is difficult to implicate any specific risk factor from those discussed above. Of importance is the investigators' recognition of the epidemic and the successful eradication of the source. Continued surveillance of donor eye cultures with the use of statistical techniques to detect clusters recently reviewed by Poser and Hibberd[30] might prevent the occurrence of serious disease such as endophthalmitis.

Moore et al have added to the growing literature on endophthalmitis following corneal transplantation. The study emphasizes the importance of proper harvesting techniques to decrease corneal donor contamination. The risk factors for postcorneal transplant endophthalmitis, a potentially blinding ocular infection, are not clearly understood: it is possible that virulence of the pneumococcus is the most important risk factor for pneumococcal endophthalmitis. Because endophthalmitis is a rare disease and a rare complication of corneal transplantation, a case control study may assist in our understanding of its risk factors and provide valuable clues for prevention.

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