Post-keratoplasty Endophthalmitis by Multidrug-resistant *Pseudomonas Aeruginosa* With Positive Culture of the Contralateral Donor Cornea: A Case Report

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ABSTRACT

Purpose. The aim of this paper is to present the case report of a patient developing endophthalmitis after penetrating keratoplasty caused by a multidrug-resistant *Pseudomonas aeruginosa*, detected only in the contralateral donor tissue.

Case Report. A 77-year-old man underwent an uneventful penetrating keratoplasty with a preoperative culture-negative donor cornea; however, the fellow cornea grew multidrug-resistant *Pseudomonas aeruginosa*. The patient developed and was treated for endophthalmitis after penetrating keratoplasty, and aqueous and vitreous taps grew *P. aeruginosa* with antibiotic resistance identical to the isolate from the mate cornea. Sequence analysis of the 16S ribosomal gene from the two isolates and confirmation analyzing the sequence of *P. aeruginosa* heat shock protein gene (groES) were performed showing the same strain for both organisms.

Conclusion. This case report documents the presence of the same multidrug-resistant *P. aeruginosa* causing endophthalmitis after penetrating keratoplasty and in the contralateral donor tissue, suggesting that we must be cautious in deciding to transplant tissues with positive culture in the contralateral donor cornea.

ENDOPHTHALMITIS after penetrating keratoplasty, although presenting with a low incidence, remains a serious issue, with those affected having reduced graft survival and poor visual outcomes, demanding immediate therapeutic intervention [1,2].

Eye banks worldwide have implemented an array of preventive strategies to avoid contamination of donor corneas, including antiseptic measures, aseptic retrieval of donor tissue, and use of antibiotics in transport and preservation media; however, corneal button contamination remains a cause of postoperative ocular infection, with endophthalmitis occurring 12 times more commonly among recipients of a culture-positive donor cornea [3].

The purpose of the present article is to present the case report of a patient developing endophthalmitis after penetrating keratoplasty caused by a multidrug-resistant *Pseudomonas aeruginosa*, detected only in the contralateral donor tissue.

CASE REPORT

The patient was a 77-year-old man with a history of aortic valve replacement and bullous keratopathy in his left eye due to cataract surgery performed 1 year before. His preoperative best-corrected visual acuity was 5/300, with intraocular pressure of 18 mm Hg and a normal preoperative B-scan ultrasonography.

The donor was a 74-year-old man with a history of diabetes mellitus and hypertension. His surgical history included a meningioma resection with intraparenchymal hemorrhage, intensive care unit stay of 4 days, finally leading to cardiopulmonary arrest and death. Pre-recovery testing for communicable diseases was negative

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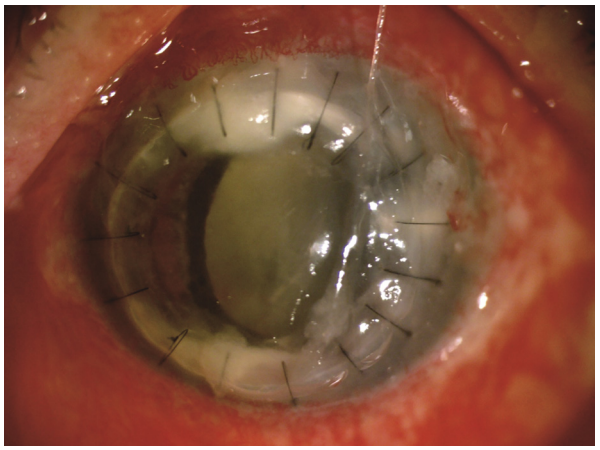

Fig 1. Edematous graft with superior and inferior infiltrates.

for hepatitis B and Ca, HIV-1 and 2 antibodies, and venereal disease. The corpse remained refrigerated prior corneal recovery. Death to recovery time was 4 hours 18 minutes, and death to transplantation time was 7 days. Donor tissue was stored at 4°C in preservation media (Optisol-GS, Bausch & Lomb, Rochester, NY, United States). As a routine procedure in our center and according to national guidelines in corneal transplantation, a sample of the preservation media was sent for culture in chocolate agar and brain-heart infusion medium and performed Gram's and Giemsa's stains. The sample of the right donated cornea grew *Pseudomonas aeruginosa* 24 hours after sowing, which was resistant to ampicillin, piperacillin/tazobactam, ceftazidime, ceftriaxone, cefepime, imipenem, meropenem, gentamicin, tobramycin, ciprofloxacin, moxifloxacin and trimethoprim/sulfamethoxazole using the Vitek system (Vitek 2C, bioMérieux, Marcy, Etoile, France). The sample of the left cornea showed no microbiological growth; however, because of the positive result in the contralateral tissue, the culture was repeated: the results remained negative, and were incubated for at least 72 hours before declaring them negative. Both corneas were managed separately since recovery, the cornea with positive culture result was discarded, and the cornea without growth was designated to be adequate for transplantation.

The patient underwent an uneventful penetrating keratoplasty with routine instillation of moxifloxacin 0.5% (Vigamoxi, Alcon laboratories, Fort Worth Texas, United States) at the end of the surgery. Postoperative management included moxifloxacin 0.5% 4 times a day and prednisolone acetate 1% (Prednefrin, Allergan, Los Angeles, California, United States) every 4 hours in a dose-reducing scheme. At postoperative day 1, the visual acuity was 20/400 with moderate corneal edema and no signs of infection in the graft, and minimal anterior chamber reaction.

Three days after surgery the patient was admitted because of complaints of pain and decreasing vision. Upon examination, visual acuity was 1/200, and biomicroscopy was notable for intense conjunctival injection, mucous discharge, showing that the graft was edematous with superior and inferior infiltrates in both donor and host, and a 1-mm hypopyon (Fig 1). B-scan ultrasonography was suggestive for vitreous abscess and pseudomembranes.

Diagnosis of acute postkeratoplasty endophthalmitis was made and aqueous and vitreous taps were obtained and sent for culture. Initial treatment was started with intravitreal injection of ceftazidime 2 mg/0.1 mL, vancomycin 1 mg/0.1 mL, and dexamethasone 2 mg/0.1 mL, repeated at 48 and 96 hours, with topical fortified ceftazidime 50 mg/mL, and moxifloxacin 0.5% drops every 30 minutes, and oral ciprofloxacin 750 mg twice a day.

Despite antibiotic resistance reported for the mate cornea, clinical improvement was noted early, with progressive decrease of the corneal infiltrates and anterior chamber reaction, and the patient's perception of improvement in visual acuity; therefore, the same antibacterial scheme was maintained. Aqueous and vitreous taps grew *P. aeruginosa* with antibiotic resistance identical to the isolate from the mate cornea which suggested the possibility that these organisms were of the same strain.

To objectively analyze this, sequence analysis of the 16S ribosomal gene from the two isolates of *P. aeruginosa* was performed (Fig 2). This result was then confirmed analyzing the sequence of *P. aeruginosa* heat shock protein gene (groES).

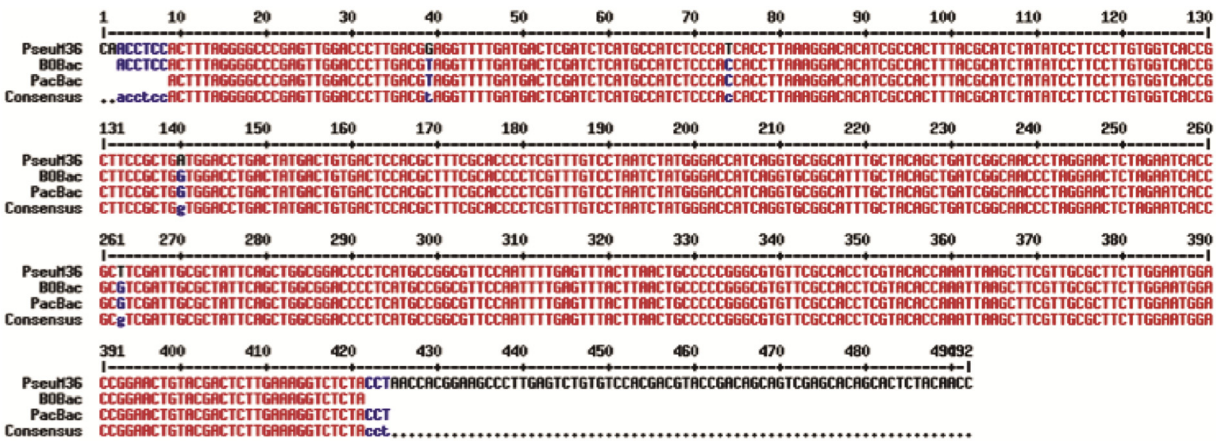

Fig 2. Sequence annealing of 16S ribosomal gene from *Pseudomonas aeruginosa* isolates from aqueous/vitreous sample and mate cornea. The results showed that two isolates are the same strain of *P. aeruginosa*. PseuM36 represents a strain from the GenBank with access number M63957.1; BOBac is the isolated from the discarded cornea and PacBac corresponds to the strain from the patient's vitreous sample.

Two months after resolution of the inflammation, visual acuity was 20/800 secondary to graft failure. B-scan ultrasonography revealed attached retina and moderate vitreous opacities. The patient remains on a waiting list for a re-grafting procedure.

DISCUSSION

Corneal graft infections caused by multidrug resistant *P. aeruginosa* is associated with more than 60% of failure and a high rate of re-graft [4]. Among the cases of culture-proven endophthalmitis after keratoplasty, those patients attributed to *P. aeruginosa* are usually uncommon (5%) [2]. *P. aeruginosa* endophthalmitis is rapidly progressive and associated with poor outcomes [5].

Evidence on the relevance of a culture positive fellow cornea remains limited, and poses the eye bank and surgeon a difficult decision. Hou et al reported a case series of *Clostridium perfringens* endophthalmitis after penetrating keratoplasty with contaminated corneal allografts in which fellow corneas were involved and had similar outcomes among them [6]. One report by the Eye Bank Association of America advised that endophthalmitis occurred after transplantation of the contralateral cornea from the same donor in 24 of 121 cases of endophthalmitis [7]. Another report of the same association but on fungal infection after corneal transplantation remarkably found that approximately three-quarters of the mates of corneas that produce fungal infection in the recipient are themselves fungal culture−positive, and that two-thirds result in fungal infection in the recipient, attributing this finding to the similar microbiota of the two eyes [8]. Furthermore, Kitazawa et al described a case in which a white opacity that resembled infectious infiltrates was observed on the donor corneal graft during the surgical procedure; therefore, this graft was removed, instead using the contralateral graft from the same donor, resulting in *Candida albicans* endophthalmitis [9].

On the other hand, none of the patients in the large study from the United Kingdom who received the fellow cornea from the same donor of the patients with endophthalmitis after penetrating keratoplasty were reported to have developed infection [1].

Although most of the case series discussing contamination with the same micro-organism between corneas assume that the pathogen is the same based in the similar antibiotic sensitivity, through microbiological analysis we showed with an objective methodology that the organism was of same strain in the transport media of one cornea, and in the intraocular fluids of the patient with endophthalmitis who received the other cornea.

With this case report, we attempt to discuss two issues. First, although having high sensitivity and specificity in positive donor rim cultures [3], but with the fact that the transport and preservation medium contains antibiotics and may inhibit the growing of some micro-organisms, this gap of false negative results raises the question of whether culture negative corneas are suitable for surgery in the context of positive cultures in the fellow donor eye. Second, in our setting, the microbiological testing of medium of the corneas attempted for transplantation is performed as a routine procedure, as in other countries including New Zealand and the United Kingdom [1]; this may be helpful to determine if the cornea is suitable for surgery. In a similar setting to ours, where one cornea had negative culture and the fellow a positive one, extended microbiological analysis may be helpful to determine the presence of contamination; however, the cost-benefit of this procedure must be assessed.

In summary, this case report documents the presence of the same multidrug-resistant *P. aeruginosa* causing endophthalmitis after penetrating keratoplasty and in the contralateral donor tissue, suggesting that we must be cautious in deciding to transplant tissues with positive culture in the contralateral donor cornea.

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