Acute interface infectious keratitis with multidrug resistant *Klebsiella* and *Escherichia Coli* following deep anterior lamellar keratoplasty

Soham Basak, Samar K Basak, Suman Saha

Acute interface infectious keratitis (AIIK) is a rare and devastating complication following lamellar keratoplasty. Here, we report a case of AIIK following deep anterior lamellar keratoplasty (DALK) caused by double gram-negative bacilli and required urgent therapeutic penetrating keratoplasty (TPK). Microbiology revealed co-infection with *Klebsiella* and *E. Coli* sensitive only to colistin. Donor rim culture also grew *Klebsiella*. TPK was successful in controlling the infection and the patient responded to topical fortified amikacin and ciprofloxacin. Since optical quality tissue was used, the patient regained 20/40 vision postoperatively. This report highlights that immediate TPK and intense antimicrobial therapy can salvage these eyes with good visual outcome.

**Key words:** Deep anterior lamellar keratoplasty, interface infection, multidrug resistance, therapeutic keratoplasty

Nowadays deep anterior lamellar keratoplasty (DALK) is preferred over penetrating keratoplasty for the treatment of corneal stromal pathologies.[3-5] Postoperative acute interface infectious keratitis (AIIK) following DALK is a rare, devastating, and potentially sight-threatening complication, mainly caused by *Candida spp.*[1-2] There are only three published reports about AIIK following DALK due to *Klebsiella pneumoniae*.[6-8] Gram-negative bacteria are common nosocomial pathogens, and sometimes corneas from hospitalized donors are contaminated. These organisms are notorious for being multi-drug resistant (MDR).[9,10] Since the exudates are trapped in the potential space between the donor cornea and host Descemet membrane (DM), surgical management in the form of therapeutic penetrating keratoplasty (TPK) is often required.[5]

In this case report, we describe the successful management of a case of AIIK following DALK with double MDR organisms, *Klebsiella pneumoniae*, and *Escherichia coli*.

**Case Report**

A 20-year-old male presented with diminished vision in the right eye due to vascularized corneal scar with lipid keratopathy and had reduced corneal sensations [Fig. 1a and b]. The probable diagnosis was post herpes simplex virus keratitis (HSVK) scar. Preoperative best-corrected visual acuity (BCVA) was 20/400 and ultrasonography (USG) B-scan was unremarkable. After taking informed written consent, DALK was planned under general anesthesia.

Intraoperatively, there was DM microperforation, which was managed with fibrin glue. Postoperatively, the patient received topical prednisolone acetate, moxifloxacin, and prophylactically oral acyclovir 400 mg twice daily. On the first postoperative day, there was mild graft edema and BCVA was 20/120. The anterior chamber was quiet, and the graft was attached to the underlying host DM.

On the second postoperative day, the patient presented to an emergency with decreased vision and redness, but he did not complain of pain or photophobia. The vision had decreased to hand motion and slit-lamp examination revealed infiltrates along the graft host junction, interface exudates, and hypopyon [Fig. 2a and b]. The interface exudates caused the host DM to detach from the graft as seen in anterior segment optical coherence tomography [Fig. 2c]. Our provisional diagnosis was a donor-related bacterial infection. USG B-scan showed no involvement of the posterior segment.

Since there was extensive interface involvement, urgent full-thickness TPK was done on the same day using optical quality donor tissue. Host trephination was oversized by 0.50 mm from the prior surgery. Thorough irrigation of the interface was done with fortified vancomycin (50 mg/ml) and fortified amikacin (40 mg/ml) to prevent further contamination of host cornea. This was followed by the removal of the host Descemet-endothelial layer, and the anterior chamber was also irrigated thoroughly. New donor cornea was secured with 16 interrupted 10-0 nylon sutures.

A standard microbiology workup was performed with the excised infected corneal button and exudates. Immediate 10% potassium hydroxide (KOH) mount examination showed no fungal filaments and Gram stain showed gram-negative bacillus (GNB). Based on these findings, postoperative treatment was hourly topical fortified amikacin, ciprofloxacin, atropine, and oral ciprofloxacin (750 mg) twice daily for 7 days. Prior medications were stopped.

The excised tissue was plated directly on multiple solid media and incubated at 37°C. Gram staining and biochemical characteristics confirmed mixed GNB infections – *Klebsiella* and *Escherichia Coli*.

**Access this article online**

Quick Response Code:

Website: www.ijo.in

DOI: 10.4103/ijo.IJO_2348_19

Department of Cornea, Disha Eye Hospitals, Barrackpore, 'Department of Microbiology, Priyamvada Birla Aravind Eye Hospital, Kolkata, West Bengal, India

**Correspondence to:** Dr. Soham Basak, Disha Eye Hospital, Ghoshpara Road, Barrackpore, Kolkata - 700 120, West Bengal, India. E-mail: sohambasak88@gmail.com

Received: 22-Dec-2019 Revision: 28-Feb-2020
Accepted: 10-Mar-2020 Published: 24-Jul-2020

Cite this article as: Basak S, Basak SK, Saha S. Acute interface infectious keratitis with multidrug resistant *Klebsiella* and *Escherichia Coli* following deep anterior lamellar keratoplasty. Indian J Ophthalmol 2020;68:1678-80. This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms. For reprints contact: WKHLRPMedknow_reprints@wolterskluwer.com
pneumonia and Escherichia coli. The sensitivity pattern by Kirby-Bauer disc diffusion method with 27 drugs showed extended drug resistance with sensitivity only to colistin. The donor rim culture of the tissue used for DALK also grew Klebsiella pneumonia with a similar antibiotic sensitivity pattern.

Since the patient was improving clinically, and no further signs of infection were seen, the medications were not changed. Three days after TPK, BCVA was 20/200 and the graft was clear. The fortified amikacin and ciprofloxacin drops were reduced to 8 times and topical prednisolone and oral acyclovir were restarted. Seven days after TPK, BCVA had improved to 20/80 and the patient was asked to continue topical ciprofloxacin for 2 weeks more and topical prednisolone 4 times was continued. After a 3-months follow-up, the patient had BCVA of 20/40 [Fig. 3a and b] and he was on topical prednisolone in tapering doses, and oral acyclovir 400 mg twice daily.

Discussion
In this case, we described AIIK following DALK with double pathogen- Klebsiella pneumonia and Escherichia coli; and treated successfully with TPK. To the best of our knowledge, this is the first report of interface infection following DALK caused by two GNBs.

In prior reports of Klebsiella-related acute interface infection following DALK, TPK, or donor button replacement was required to control the infection. Two of the three cases were due to MDR organisms.[6-8]

Klebsiella and E. coli are common nosocomial pathogens both worldwide and in India, and are often MDR. Hospital-acquired Klebsiella can be harbored in the conjunctiva and sometimes cause serious ocular infection in patients during the hospital stay.[11] The Klebsiella and E. Coli isolate in this case was extended drug resistant and sensitive only to colistin. Treating such infections is very difficult, but fortunately in our patient TPK was successful. Since the postoperative period was quiet and patient was improving, we did not change to topical colistin.

In our case, the donor, a diabetic, was admitted for a week and the cause of death was renal failure. The mate cornea was used for penetrating keratoplasty and had an uneventful postoperative period, and mate donor rim did not show any growth.

What is unusual about this case is co-infection with dual organisms. First, while Klebsiella was isolated from the donor rim, E. coli was not. This contamination was probably either from the operation theatre or the patient environment. However, all other surgeries performed on the same day in the same operating room had an uneventful postoperative period. Second, the trapped exudates caused DM detachment in our case. This was due to microperforation during DALK dissection intraoperatively. Third, the patient did not complain of pain during the entire postoperative period. This is probably due to suspected HSVK being the underlying cause with loss of corneal sensation.

Conclusion
Acute interface infection following DALK is a rare but sight-threatening complication. Donor contamination is the usual source of infection, and if the donor was hospitalized, MDR strains might be making the medical treatment more difficult. With prompt surgical management under adequate antibiotic cover, it is possible to save these eyes with favorable visual outcomes.

Figure 1: (a and b) Preoperative clinical photograph

Figure 2: (a and b) Acute interface infectious keratitis on second postoperative day. Two levels of hypopyon noted in slit section (b) arrowhead – interface level and arrow – anterior chamber level. (c) Anterior segment OCT in same day showing Descemet membrane detachment with hyperreflective exudates in the interface.
and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

References
1. Reinhart WJ, Musch DC, Jacobs DS, Lee WB, Kaufman SC, Shtein RM. Deep anterior lamellar keratoplasty as an alternative to penetrating keratoplasty a report by the American academy of ophthalmology. Ophthalmology 2011;118:209-18.
2. Borderie VM, Sandali O, Bullet J, Gaujoux T, Touzeau O, Laroche L. Long-term results of deep anterior lamellar versus penetrating keratoplasty. Ophthalmology 2012;119:249-55.
3. Fontana L, Parente G, Di Pede B, Tassinari G. Candida albicans interface infection after deep anterior lamellar keratoplasty. Cornea 2007;26:883-5.
4. Kanavi MR, Foroutan AR, Kamel MR, Afsar N, Javadi MA. Candida interface keratitis after deep anterior lamellar keratoplasty: Clinical, microbiologic, histopathologic, and confocal microscopic reports. Cornea 2007;26:913-6.
5. Fontana L, Moramarco A, Mandarà E, Russello G, Iovieno A. Interface infectious keratitis after anterior and posterior lamellar keratoplasty. Clinical features and treatment strategies. A review. Br J Ophthalmol 2019;103:307-14.
6. Zarei-Ghanavati S, Sedaghat M-R, Ghaam-Shahri A. Acute Klebsiella pneumoniae interface keratitis after deep anterior lamellar keratoplasty. Jpn J Ophthalmol 2011;55:74-6.
7. Egrilmez S, Palamar M, Sipahi OR, Yagci A. Extended spectrum beta-lactamase producing Klebsiella pneumoniae-related keratitis. J Chemother 2013;25:123-5.
8. Bajracharya L, Sharma B, Gurung R. A case of acute postoperative keratitis after deep anterior lamellar keratoplasty by multidrug resistant Klebsiella. Indian J Ophthalmol 2015;63:344-6.
9. Magill SS, Edwards JR, Bamberg W, Beldavs ZG, Dunyati G, Kainer MA, et al. Multistate point-prevalence survey of healthcare-associated infections. N Engl J Med 2014;370:1198-208.
10. Bhadade R, Harde M, deSouza R, More A, Bharimal R. Emerging trends of nosocomial pneumonia in intensive care unit of a tertiary care public teaching hospital in Western India. Ann Afr Med 2017;16:107-13.
11. Aung T, Chan TK. Nosocomial Klebsiella pneumoniae conjunctivitis resulting in infectious keratitis and bilateral corneal perforation. Cornea 1998;17:558-61.

Figure 3: (a and b) Postoperative 3 months after therapeutic keratoplasty. Clear and compact graft maintained.