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Case report

Successful therapeutic DALK for *Pseudomonas* keratitis with excellent visual outcome

A. P. Dinaratne[1], K. Ratnayake[2]

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Introduction

Pseudomonas aeruginosa is a gram-negative rod and an opportunistic pathogen in humans. It is a common cause of bacterial keratitis, particularly in contact lens wearers. *Pseudomonas aeruginosa* causes aggressive and multi drug resistant keratitis where proteases that are secreted by the organism causes liquefactive necrosis of the cornea, leading to rapid corneal melting and perforation.

Pseudomonas keratitis is primarily treated with medical therapy, but due to its multi drug resistant nature, it may require surgical treatment. Among the cases requiring surgical treatment, those with extensive keratitis involving full thickness of the cornea will need Penetrating Keratoplasty (PKP) while in cases where only partial thickness of the corneal stroma is involved, sparing the DM-Endothelium complex, Therapeutic Deep Anterior Lamellar Keratoplasty (T-DALK) can be performed.

Case report

A 23 year old lady was referred to the cornea unit with a corneal ulcer in the right eye which had occurred following contact lens wear and was poorly responsive to medical treatment. She was a teledrama actress by profession and was highly concerned about her vision as well as the cosmetic appearance of her eye.

She had a central ulcer involving the visual axis, measuring 5x5 mm in size and involving the anterior half of the corneal stroma. Ulcer scraping as well as contact lens culture was positive for *Pseudomonas aeruginosa* and medical therapy with topical moxifloxacin, tobramycin and ceftazidime along with subconjunctival gentamicin injections was given according to the ABST. Therapeutic Collagen Cross Linking (CXL) was also done with the aim of stabilizing the ulcer. Despite aggressive inward treatment for one month the ulcer progressed with the development of a 1 mm hypopyon (Figure 1) and her visual acuity was Hand Movements (HM).

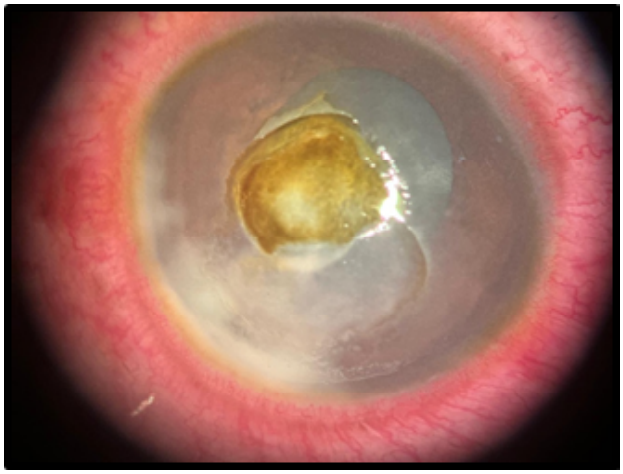

Figure 1. *Central corneal ulcer with hypopyon.*

HD Cornea (High Definition OCT) confirmed involvement of the anterior and mid stroma sparing the Descemet Membrane (Figure 2), therefore Therapeutic DALK was performed with the Manual Dissection technique, with graft and host sizes of 8.25 mm and 8.00 mm respectively. Anterior Chamber (AC) washout was done and intracameral ceftazidime was given. Immediate post appearance is shown in Figure 3. The culture of the corneal button came positive for *Pseudomonas aeruginosa*.

Her infection completely cleared and topical steroids were started within one week. The graft remained clear with no vascularization. Her Best Spectacle Corrected Visual Acuity (BSCVA) was 6/9 with minimal astigmatism (+2.00 - 2.00 x 70 = 6/9) and she returned to her work with maximum satisfaction about her vision and cosmetic appearance of the eye. Figure 4 and 5 show the post op 2 month and 1 year appearances respectively.

[1]*Acting Consultant in Cornea and External Eye Diseases, National Eye Hospital, Colombo, Sri Lanka,* [2]*Consultant Cornea and External Eye Disease Specialist, National Eye Hospital, Colombo, Sri Lanka.*

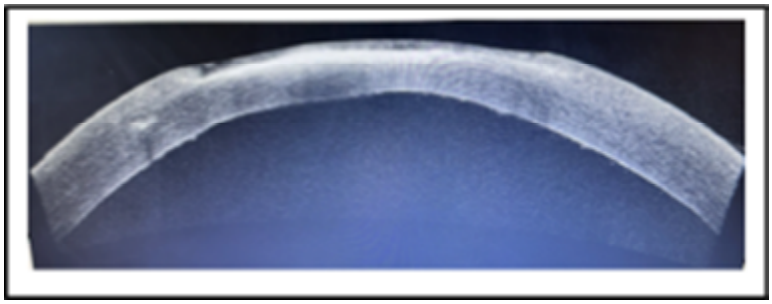

Figure 2. *HD Cornea of ulcer.*

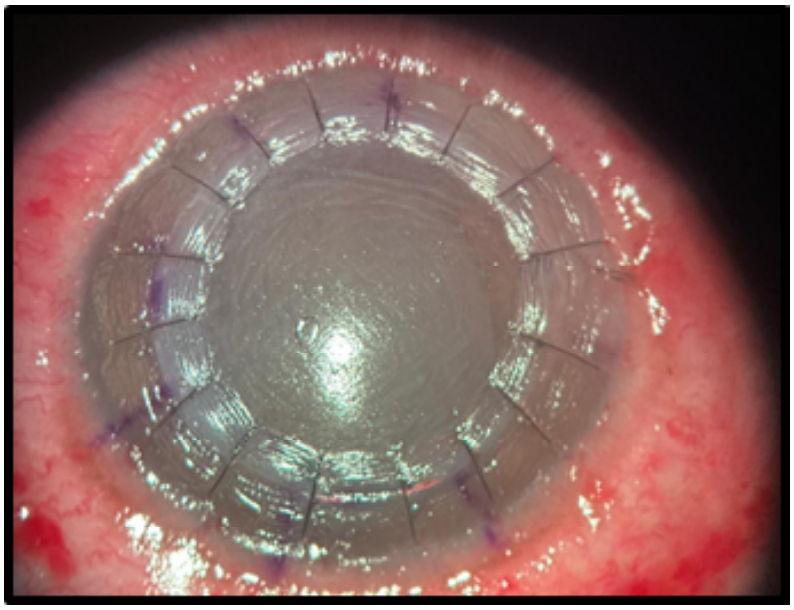

Figure 3. *Immediate postop appearance.*

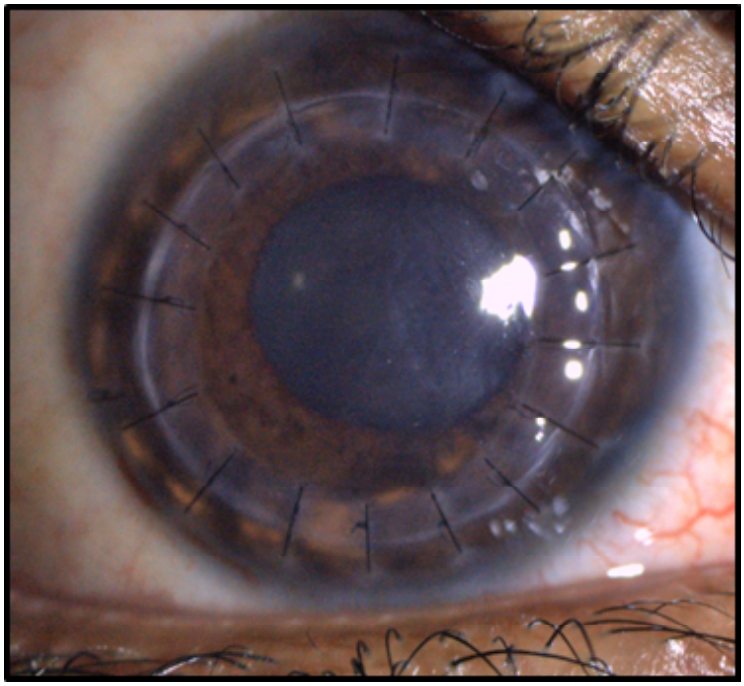

Figure 4. *Post op 2 months.*

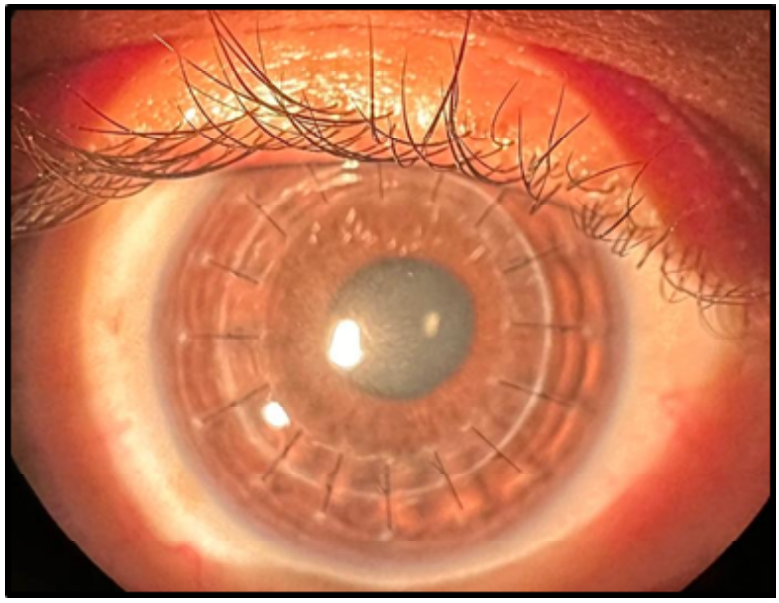

Figure 5. *Post op 1 year.*

Discussion

Pseudomonas aeruginosa keratitis is strongly associated with contact lens wear as extended contact lens use allows adhesion of *P. aeruginosa* to contact lens surfaces and subsequently the cornea[1]. *P. aeruginosa* possesses specific virulence factors, including pili, glycocalyx, and exotoxins,which allow adherence and invasion into the cornea[1]. The infection also induces an extensive inflammatory response which contributes to the corneal destruction[2].

Resistance to medical therapy is common in *Pseudomonas aeruginosa* keratitis and multi drug resistant strains are also common[3].

In our case, the organism showed susceptibility to ceftazidime, fluoroquinolones and gentamicin, however, there was clinical progression of the ulcer even with inward treatment for one month, therefore warranting surgical treatment.

Penetrating keratoplasty (PKP) and deep anterior lamellar keratoplasty (DALK) are the available options for keratoplasty and careful selection of cases and optimal timing allows optimal surgical outcome[4]. DALK is a better alternative to penetrating keratoplasty in cases where the descemet membrane (DM) is spared as it has several advantages over PKP. These include reduced risk of graft rejection, graft failure, cataract and glaucoma[5,6].

The outcome of any type of graft is better when the eye is less inflamed[7,8] and DALK is frequently performed as an optical graft in cases where the ulcer has been sterilized with medical therapy and resultant scarring is present[9]. However, in cases resistant to medical therapy, DALK may be performed in the presence of active infection.

Another important aspect of our case is the patient's age and occupation. In circumstances where a very long inward stay is cumbersome for a patient and where the visual acuity and cosmetic appearance of the eyes is extremely crucial, as in this lady involved in the performing arts, a successful DALK surgery has utmost value. As the risk of vascularization and rejection is less than in PKP[5,6], the clarity of the cornea is preserved with good cosmetic appearance. In our case the cornea remains clear with excellent visual acuity at 1 year follow-up with no other complications.

There are several reported cases of successful DALK for active microbial keratitis from different parts of the world however reported cases of therapeutic DALK in active pseudomonas keratitis are scarce. There are no previously reported cases of T- DALK for pseudomonas keratitis in Sri Lanka.

In a study by Sarnicola et al early therapeutic DALK has been considered a new approach to eradicate active Acanthamoeba Keratitis cases with significant ulcer in the optical zone and with poor response to medical treatment[10].

In another report by Parthasarathy et al, successful DALK in a medically unresponsive case of Acan-

thamoeba keratitis was done, resulting in a best corrected visual acuity of 20/20[11].

Anrushi Agrawal et al has reported a case of successful DALK performed for a case of fungal keratitis unresponsive to medical treatment with a final BCVA of 6/24[12].

Conclusion

Therapeutic DALK is a successful management option for cases of infectious keratitis where DM and posterior stroma are intact. It can be done in the presence of active keratitis with hypopyon and if done with caution and perfect suturing, excellent visual outcome can be achieved.

References

1. Dart JKG, Seal DV. Pathogenesis and Therapy of Pseudomonas aeruglnosa Keratitis. *Eye* (1988) 2, Suppl S46-S5.
2. Willcox, M. Management and treatment of contact lens-related Pseudomonas keratitis. *Clinical Ophthalmology* 2012; 919. https://doi.org/10.2147/opth.s 25168
3. Rezaei S, Steen D, Amin S. Successful treatment of an extensively drug-resistant pseudomonal ulcer associated with contaminated artificial tears. *American Journal of Ophthalmology Case Reports* 2023; **32**: 101909. https://doi.org/10.1016/j.ajoc.2023.101909
4. Anshu A, Parthasarathy A, Mehta JS, Htoon HM, Tan, DT. Outcomes of therapeutic deep lamellar keratoplasty and penetrating keratoplasty for advanced infectious keratitis. *Ophthalmology* 2009; **116**(4), 615-23. https://doi.org/10.1016/j.ophtha.2008.12.043
5. Shams M, Sharifi A, Akbari Z, Maghsoudlou A, Reza Tajali M. Penetrating Keratoplasty versus Deep Anterior Lamellar Keratoplasty for Keratoconus: A Systematic Review and Meta-analysis. *J Ophthalmic Vis Res*. 2022; **17**(1): 89-107. doi: 10.18502/jovr.v17i1.10174. PMID: 35194500; PMCID: PMC8850853.
6. 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**(1):209-18. doi: 10.1016/j.ophtha.2010.11.002. PMID: 21199711
7. Patel SV. Graft survival after penetrating keratoplasty. *Am J Ophthalmol*. 2011; **151**(3): 397-8. doi: 10.1016/j.ajo.2010.10.006. PMID: 21335107; PMCID: PMC3900559.
8. Coster D, Williams K. Management of high-risk corneal grafts. *Eye* 2003; **17**: 996-1002. https://doi.org/10.1038/sj.eye.6700634
9. Arun K, Georgoudis P. (2024). Pseudomonas keratitis: From diagnosis to successful deep anterior lamellar keratoplasty. *Cureus*. https://doi.org/10.7759/cureus.56154
10. Sabatino F, Sarnicola E, Sarnicola C, et al. Early deep anterior lamellar keratoplasty for fungal keratitis poorly responsive to medical treatment. *Eye* 2017; **31**: 1639-46. https://doi.org/10.1038/eye.2017.228
11. Parthasarathy A, Tan DT. Deep lamellar keratoplasty for acanthamoeba keratitis. *Cornea* 2007; **26**(8): 1021-23. https://doi.org/10.1097/ico.0b013e3181131ea9
12. Agrawal A, et. al. Therapeutic deep anterior lamellar keratoplasty for a case of non- resolving microbial keratitis. *IOSR Journal of Dental and Medical Sciences* (IOSR-JDMS), 2020; **19**(5): 36-9.