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COMBINATION OF CONSERVATIVE THERAPY AND CORNEAL CXL FOR THE MANAGEMENT OF PSEUDOMONAS CORNEAL ULCER WITH MELT IN A PREGNANT PATIENT

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No coflicts of interest to declare.

Introduction

Microbial keratitis is a major, preventable cause of corneal blindness, and in high-income settings it is most often linked to contact lens wear; additional risks include trauma, ocular surface disease/exposure, recent surgery, topical corticosteroid use, and immunosuppression.[1]

P. aeruginosa is a leading Gram-negative cause—particularly in contact lens–associated disease—and its clinical relevance is amplified by virulence-mediated tissue destruction and emerging antimicrobial resistance. Diagnosis relies on slit-lamp examination with fluorescein staining and urgent microbiology: corneal scraping for Gram stain and culture with susceptibility testing, plus culture of contact lenses/cases when relevant.[2]

Pregnancy-specific practice aims to preserve maternal vision while limiting fetal exposure. Large observational data suggest topical ophthalmic antibiotics (including topical fluoroquinolones in early pregnancy) are not associated with major adverse neonatal outcomes, but expert reviews still recommend reserving fluoroquinolones for situations where alternatives are inadequate; if systemic therapy is required, avoiding tetracyclines and using systemic fluoroquinolones only when clearly indicated are common obstetric safeguards.[3]

Case Presentation

A 34-year-old phakic woman, contact lens wearer, at 19 weeks and 4 days of gestation, with a past medical history of psoriatic arthritis for which she was not receiving treatment, presented with a two-day history of painful decrease in visual acuity. Visual acuity was measured at 20/200.

Slit-lamp examination revealed a paracentral corneal ulcer measuring 5.0 × 3.5 mm, with well-defined margins and no limbal involvement, accompanied by dense stromal infiltration and stromal melting. Marked conjunctival hyperemia and Descemet's membrane folds were noted. A pronounced anterior chamber reaction (4+) was present, associated with a 0.5 mm hypopyon. ***(Figure 1)***

1. Ung L, Bispo PJM, Shanbhag SS, Gilmore MS, Chodosh J. The persistent dilemma of microbial keratitis: Global burden, diagnosis, and antimicrobial resistance. Surv Ophthalmol. 2019 May-Jun;64(3):255-271. doi: 10.1016/j.survophthal.2018.12.003. Epub 2018 Dec 24. PMID: 30590103; PMCID: PMC7021355.
2. Cabrera-Aguas, Maria, and Stephanie L Watson. 2023. "Updates in Diagnostic Imaging for Infectious Keratitis: A Review" Diagnostics 13, no. 21: 3358. doi:10.3390/diagnostics13213358
3. Hashimoto Y, Michihata N, Yamana H, Shigemi D, Morita K, Matsui H, Yasunaga H, Aihara M. Safety of topical ophthalmic antibiotics in pregnant women with hordeola, chalazia, blepharitis, or bacterial conjunctivitis: propensity score analyses. Eye (Lond). 2022 May;36(5):1066-1073. doi: 10.1038/s41433-021-01586-y. Epub 2021 May 25. PMID: 34035495; PMCID: PMC9046183.

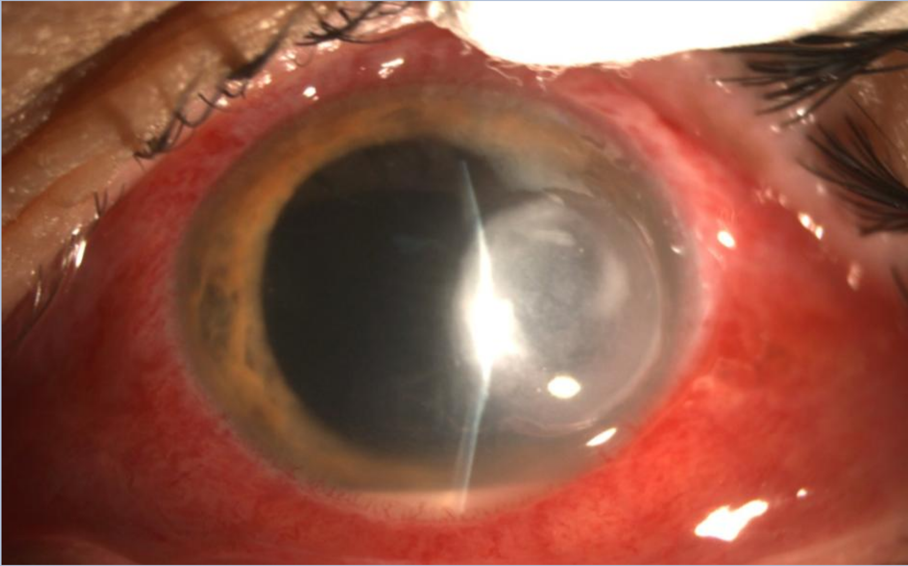

Figure 1 Corneal Ulcer 5.0 x 3.5 mm with melting, stromal infiltration, anterior chamber reaction with hypopyon

Management

Corneal scrapings were obtained for microbiological cultures and PCR analysis.

Following consultation with obstetricians–gynecologists, intensive empirical treatment was initiated:

- Topical *amikacin* every 15 minutes for the first 3 hours, then hourly during daytime (pregnancy category D; topical use generally considered acceptable due to minimal systemic absorption).
- Topical *vancomycin* hourly during the day and every 2 hours overnight (pregnancy category B; considered safe for topical administration).
- Topical *atropine* three times daily (pregnancy category C; safer when administered topically).
- Intravenous *ceftazidime* 2 g three times daily, subsequently reduced to 1 g three times daily (pregnancy category B).

Laboratory Workup

Corneal scrapings and contact lens cultures yielded Pseudomonas aeruginosa, susceptible to amikacin and tobramycin.

PCR analysis was negative for Acanthamoeba and fungal pathogens.

Microbiological confirmation enabled targeted antimicrobial therapy and supported continuation of anti-pseudomonal treatment.

Intervention

Initial intensive therapy achieved resolution of hypopyon and significant reduction of anterior chamber inflammation.

However, despite microbiologically guided treatment during the course of 2 weeks ***(Figure 2)***

- The corneal ulcer showed only partial regression
- Stromal infiltration persisted
- Progressive corneal melting remained a concern

Given the risk of structural compromise, corneal collagen cross-linking (CXL) was performed using the *Dresden protocol*.

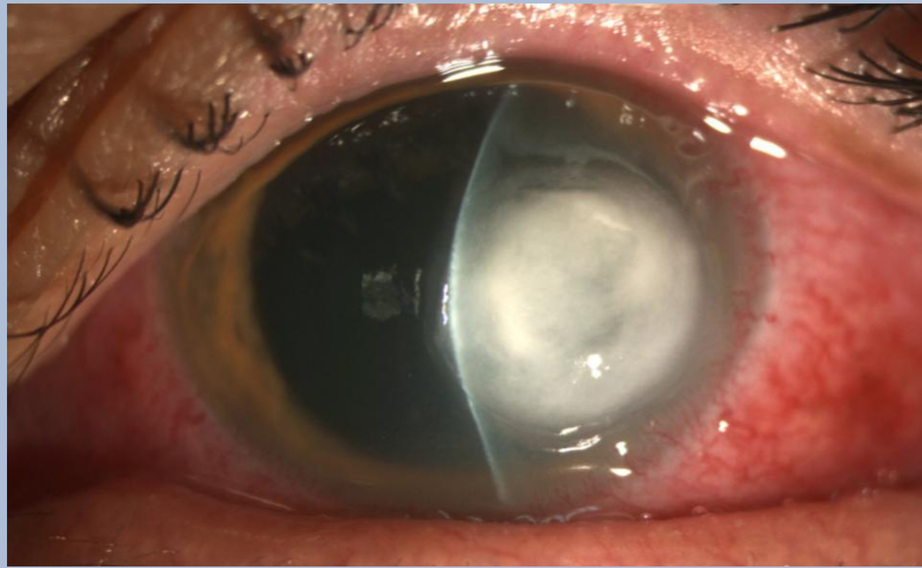

Figure 2 Two weeks after initiation of treatment, anterior chamber reaction was significantly but a corneal Ulcer 3.7 x 3.5 mm and stromal infiltration persisted.

CXL in Keratitis (PACK-CXL)

Photoactivated corneal collagen cross-linking (CXL) with riboflavin and UV-A has been primarily established for the treatment of ectatic disorders; however, its application in infectious keratitis (PACK-CXL) was proposed based on a dual mechanism of action:

(a) generation of reactive oxygen species (ROS), which can damage microbial membranes and nucleic acids, and

(b) enhancement of stromal biomechanical strength and increased resistance to proteolytic and collagenase-mediated corneal melting.[4]

Results

The patient was discharged on topical tobramycin.

Gradual and complete resolution of the corneal ulcer was achieved, with significant reduction of stromal infiltration and stabilization of corneal integrity. ***(Figure 3)***

A residual corneal scar persists and visual acuity impoved to 20/32; if visually significant, optical penetrating keratoplasty will be considered at a later stage.

Importantly, the pregnancy course remained uneventful throughout treatment.

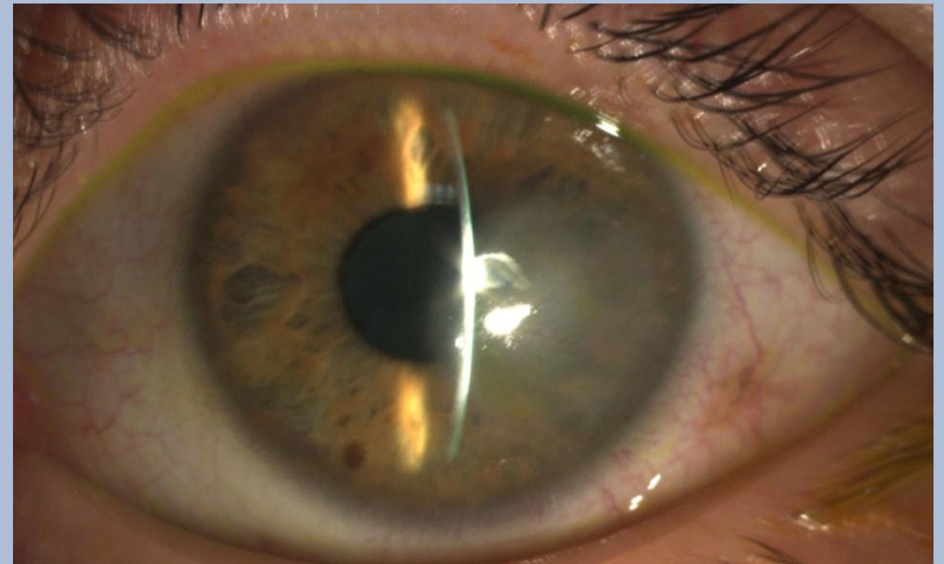

Figure 3 Three months after the CXL application, the corneal ulcer resolved, and stromal infiltration was significantly reduced.

4. Hafezi F, Hosny M, Shetty R, Knyazer B, Chen S, Wang Q, Hashemi H, Torres-Netto EA; PACK-CXL Working Group. PACK-CXL vs. antimicrobial therapy for bacterial, fungal, and mixed infectious keratitis: a prospective randomized phase 3 trial. Eye Vis (Lond). 2022 Jan 7;9(1):2. doi: 10.1186/s40662-021-00272-0. PMID: 34996516; PMCID: PMC8742313.