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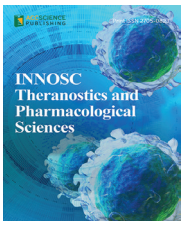

CASE REPORT

Non-Hospital-Acquired *Pseudomonas aeruginosa* Keratitis in a 7-Month-Old Infant

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Abstract:

Pseudomonas aeruginosa is one of the important pathogens causing bacterial keratitis with ulceration. In this study, we evaluated a case of non-hospital-acquired *P. aeruginosa* keratitis in a 7-month-old infant and its treatment process. The patient who had no known chronic disease was brought in with complaints of watering and redness in the left eye. The complaint of the eye problems started 1 month ago after the patient swam in a farm pool. Keratitis was diagnosed according to an ophthalmologic examination in our clinic. Left corneal scraping cultures were taken for the identification of the pathogen. Moxifloxacin eye drops and ganciclovir gel were prescribed for 10 days. The corneal haze disappeared after the treatment. Reasons for delay in diagnosis and treatment were evaluated in our case. We also compared the keratitis between adults and infants. *P. aeruginosa* keratitis should be considered in the differential diagnosis, taking into account the presence of resistance to treatment, visual disturbances, lens usage, nasolacrimal duct obstruction, trauma, and bad hygiene. Congenital nasolacrimal duct obstruction is an important risk factor for infants. Vision loss, which may happen in adults, cannot be clearly communicated by infants due to their limited communication abilities. *P. aeruginosa* should be considered the pathogen causing keratitis in infant patients, particularly when the diagnosed characteristics align with our case.

Keywords: Keratitis, *Pseudomonas aeruginosa*, Ulceration, Infant, Infection

1. Background

Infectious keratitis is a major cause of visual impairment and blindness in adults [1]. Infections are still predominant and are found in 80% of patients with ulceration [2]. One of the important pathogens of bacterial keratitis with ulceration is *Pseudomonas aeruginosa* which is often associated with contaminated contact lenses, eye trauma, and hospitalization history [3]. With various metabolic pathways and a vast repertoire of pathogenic mechanisms, this Gram-negative bacillus can survive a broad range of environmental conditions [4]. Treatment of *P. aeruginosa* keratitis may be difficult because this bacterium can resist antibiotics through intrinsic and acquired mechanisms such as the transfer of resistance through interchangeable genetic elements. A large variety of virulence factors contribute to its importance in burn wounds, lung infections, and eye infections, including pili, flagella, lipopolysaccharide, proteases, quorum sensing, exotoxin A, and exoenzymes secreted by the type III secretion system [5].

Rapid diagnosis and treatment of bacterial keratitis are essential to limit stromal scarring and minimize potential vision loss. Thus, treatment should be started empirically early [6]. This pathogen is mostly seen in adults due to contact lens usage [7]. However, the most important risk is hospitalization for infants. In the literature, *P. aeruginosa* keratitis in infants is frequently hospital-acquired. Cases of non-hospital-acquired *P. aeruginosa* keratitis in infants are especially rare.

2. Case presentation

A 7-month-old female infant who had no known chronic disease was brought in with the complaint of watering and redness on the left eye. One month prior, the patient swam in a pool on a farm, and then the complaints started. At that time, nasolacrimal duct obstruction was considered by a physician at the ophthalmologic examination, and the physician prescribed some eye drops and suggested waiting 1 year. The patient has used netilmicin and dexamethasone drops during this time. When the patient came to our clinic again, her complaints did not decrease. According to ophthalmologic examination results, the patient was diagnosed with keratitis. Macroscopically, the right eye appeared normal, and the anterior and posterior chambers of the right eye were also normal. The left eye conjunctiva was less red than in a keratitis case (**Figure 1)**.

The lesion in the cornea was not wide. Watering was observed in the left eye. Keratitis focuses were observed to prevent retinoscopy reflections in the cornea, especially on the central cornea and the lower half of the cornea. The anterior chamber, pupil, and lens looked normal. The fundus was not enlightened.

Figure 1. Pre-treatment corneal appearance.

Left corneal scraping material and cultures were taken. Gram stains of the samples from the conjunctiva and cornea were performed. Abundant leukocytes and Gram-negative bacillus were seen at the microscopic examination on Gram stains.

All samples were inoculated with 5% sheep blood, eosin methylene blue (EMB) agar, and chocolate agar containing Poly ViteX for aerobic bacterial cultures and were incubated at 37°C for 24–48 h. Samples of EMB and 5% sheep blood agar cultures from the left conjunctiva and left cornea produced typical *P. aeruginosa* (**Figure 2**). This pathogen was found to be susceptible to amikacin, ceftazidime, levofloxacin, ciprofloxacin, piperacillin, and tazobactam. Gentamicin eye drop was added to the treatment on the 4th day of the treatment.

The produced *P. aeruginosa* was detected using API 10 S Gram-negative identification kit (Biomerieux, ABD). Antibiotic susceptibility tests were performed with disc diffusion (**Figure 3**). Clinical and Laboratory Standards Institute criteria

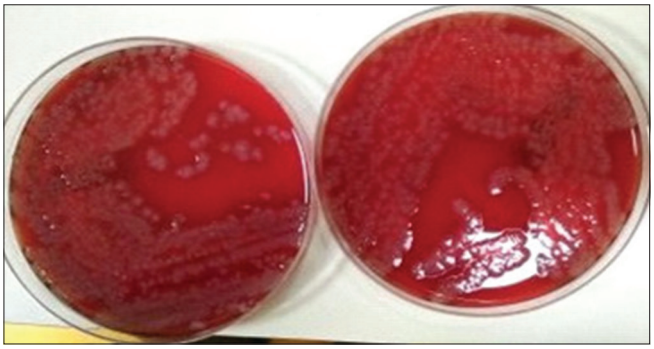

Figure 2. Bacterial culture on 5% sheep blood agar from the left corneal scraping.

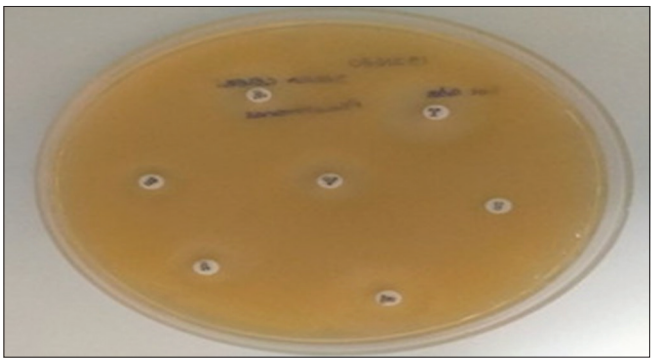

Figure 3. Muller–Hinton agar plate showed antimicrobial susceptibility profile of the pathogen.

Figure 4. Corneal appearance after treatment.

were used in the evaluation of antimicrobial resistance patterns.

As for the treatment regime, moxifloxacin eye drops and ganciclovir gel were prescribed. The corneal haze disappeared on the tenth and final day of the treatment (**Figure 4**).

Congenital nasolacrimal duct obstruction may have been a predisposing factor for the patient. Early probing was suggested to the patient.

3. Discussion

In the presented case, the isolated microorganism is associated with pathogenic keratitis, which plays a crucial role in keratitis. Environmental factors such as poor hygiene and trauma are important risk factors for keratitis. In the literature, keratitis cases caused by *P. aeruginosa* are usually associated with contact lens usage. This pathogen is rarely reported in infants without hospitalization history. As infants can not describe their complaints, diagnosis in infants can be delayed. Antibiotic resistance is a significant factor contributing to treatment delays. If treatment is delayed, this pathogen can invade the cornea, anterior chamber, and aqueous humor.

Congenital nasolacrimal duct obstruction is one of the risk factors for infants [8]. Data published by Li *et al*. shows that human tear fluid can protect against *P. aeruginosa*, the major opportunistic pathogen, independently of its bacteriostatic activity [9]. In our case, the patient had nasolacrimal duct obstruction. Furthermore, the patient had a story of swimming in a pool at a farm. We considered that the pathogen infected the patient with a nasolacrimal duct obstruction risk factor through the contaminated pool. The fact that the pathogen is susceptible to so many antibiotics also supports our opinion that it is environmentally acquired.

The intact cornea is normally resistant to invasion by *P. aeruginosa* [10]. Probably, nasolacrimal duct obstruction facilitated corneal trauma. Furthermore, the patient had a story of using corticosteroid drops. All of these reasons caused the patient to be susceptible to polymicrobial keratitis. As in the case of Hue *et al*., if the pathogen invaded the anterior chamber, systemic anti-biotherapy was needed [11]. However, local treatment was enough because there was no sign of invasion in our case.

4. Conclusion

P. aeruginosa keratitis is a disease that should be treated seriously, as it causes visual impairment if diagnosis is delayed. *P. aeruginosa* keratitis should be considered in the differential diagnosis, particularly for infants, when there are risk factors such as poor hygiene, contact lens usage, treatment-resistance keratitis, visual disturbances, and nasolacrimal duct obstruction identified in the differential diagnosis.

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Conflict of interest

The authors declare that they have no competing interests.

Author contributions

Conceptualization: Keramettin Yanik
Formal analysis: Hatice Buse Uras, Celal Yeter
Investigation: Keramettin Yanık
Supervision: Celal Yeter
Writing – original draft: Hatice Buse Uras
Writing – review & editing: Hatice Buse Uras

Ethics approval and consent to participate

Informed consent was obtained from the study subject's guardians for participating in the study.

Consent for publication

Informed consent was obtained from the study subject's guardians for publishing the data.

Availability of data

Data can be obtained from the corresponding author following formal request.

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