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Chronic Purulent Conjunctivitis Associated With Extensively Drug-Resistant *Pseudomonas aeruginosa*

Pseudomonas aeruginosa is an opportunistic, gram-negative bacterium known to cause severe infection in susceptible hosts through its ability to form biofilms and secrete virulence factors. The World Health Organization has classified carbapenem-resistant *P aeruginosa* as a bacterium of critical priority for the development of new treatments.[1]

P aeruginosa is not typically encountered on the ocular surface[2] but when present can lead to conjunctivitis or liquefactive keratitis.[3] The Centers for Disease Control and Prevention (CDC) recently released a statement alerting ophthalmologists to an outbreak of carbapenem-resistant *P aeruginosa*.[4] Since the first known case in May 2022, the CDC has identified 64 resistant *P aeruginosa* infections in 13 states, 14 of which were isolated in corneal tissue and several linked to EzriCare artificial tears.[5] We present a case of purulent conjunctivitis associated with extensively drug-resistant *P aeruginosa* that is likely related to this outbreak.

Report of a Case | A 79-year-old man with paraplegia, neurogenic bladder, and chronic urinary tract infection (UTI) presented in August 2022 after 4 months of right eye redness, discharge, pain, and decreased vision. He had already been using topical moxifloxacin, bacitracin-polymyxin ointment, and antibacterial Avenova spray each 4 times daily in his right eye for chronic conjunctivitis.

On examination, his best-corrected visual acuity was 20/200 OD and 20/25 OS with normal intraocular pressures. His right eye had copious mucopurulent discharge, 3+ conjunctival hyperemia, and prominent palpebral papillae (**Figure**). The corneal epithelium was intact but diffusely hazy with punctate epithelial erosions identified with fluorescein. The anterior chamber was deep and quiet, and there was a limited view to his fundus. His left eye was unremarkable. Gram stain and cultures of the mucopurulent discharge were collected by inferior fornix swab, and the patient was admitted to the hospital. Hourly topical fortified vancomycin (2.5%) and ceftazidime (5%) were started, and intravenous meropenem was given for his chronic UTI. An orbit computed tomography scan showed normal lacrimal system and sinuses. Cultures speciated *Staphylococcus aureus* resistant to penicillin. The patient's right eye improved marginally over the 3-day hospital course, and he was discharged with a regimen of fortified vancomycin every 2 hours, saline irrigation, tobramycin/dexamethasone ointment nightly, and oral amoxicillin/clavulanic acid.

Biweekly follow-up examinations remained stable with 20/200 OD and continued 3+ conjunctival hyperemia and mucopurulent discharge with intact corneal epithelium. One month after discharge, he was readmitted for increased pain. Repeat conjunctival cultures demonstrated *P aeruginosa* resistant to all antibiotics except piperacillin/tazobactam, with a minimum inhibitory concentration of 16 µg/mL. This result was reported to the CDC. Intravenous piperacillin-tazobactam and tobramycin were added, and topical trimethoprim/polymyxin 4 times a day, tobramycin and vancomycin every 2 hours, prednisolone 4 times a day, and nightly tobramycin/dexamethasone were continued. After 10 days, a new infiltrate was noted with 10% thinning. Topical and intravenous antibiotics were stopped, and oral doxycycline, 100 mg twice a day, and vitamin C, 2 g per day, topical cyclosporine, 0.05%, and preservative-free lubrication were started to slow corneal thinning. Povidone-iodine flushes (2.5%) were initiated with marginal improvement of the mucopurulent discharge. Three separate conjunctival cultures demonstrated extensively resistant *P aeruginosa*. He was discharged with this regimen with minimal improvement. At his last visit nearly 9 months after onset of the conjunctivitis and 5 months after we initially saw him, the visual acuity in his right eye degraded to light perception with continued severe hyperemia, purulent discharge, and diffusely hazy cornea. He was awaiting evaluation with a corneal specialist at an academic center.

Figure. Mucopurulent Discharge, Conjunctival Hyperemia, and Corneal Haze in the Patient's Right Eye

There was fluctuation in the discharge throughout his course, but the gross appearance of the eye did not significantly change despite intensive topical and systemic antibiotics.

Discussion | Antibiotic resistance poses an increasing threat to treatment options for ocular infections with high risk for vision loss. This case highlights an example of an ocular surface infection associated with vision loss that intensive topical and systemic therapies have failed to resolve, with the term *extensively resistant* denoting lack of sensitivity to at least 1 antimicrobial in all but 1 category.[6] This patient's specific risk factors included age, chronic UTI, and preceding topical and systemic antibiotic use, which likely altered ocular surface flora. As drug resistance spreads, it remains to be determined whether cutoffs for systemic antibiotic minimum inhibitory

concentration are directly applicable or whether it is prudent to test eye drops separately in cases of ocular infection.

Eye care professionals should be vigilant about identifying and reporting these cases to their local health department. Updated surveillance data are published on the CDC website,[5] where there are also links to Healthcare-associated Infections and Antimicrobial Resistance (HAI/AR) programs by state.

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COMMENT & RESPONSE

Ophthalmological Findings in Youths With a Newly Diagnosed Brain Tumor

To the Editor I read with interest the article by Nuijts et al[1] on symptoms and ophthalmological findings in pediatric patients presenting with brain tumors. This a prospective national cohort study in the Netherlands of all children presenting with a brain tumor over a more than 2-year period that included defined ophthalmologic examinations performed or attempted on every child who presented with a brain tumor.

The study by Nuijts et al[1] did not include information regarding the vision-related quality of life in children with brain tumors. In a previous report by Peragallo et al[2] on 77 pediatric patients with primary brain tumors who underwent standardized neuro-ophthalmic evaluations in a prospective cohort study at a single tertiary care center, 2 vision-related quality-of-life questionnaires validated for use in children with vision problems were used. These questionnaires were completed by the patient, except for in the youngest patients (ages 3 to 4 years), who had their questionnaires completed by a proxy. A total of 57% were visually impaired and 9% were legally blind, in contrast with the authors[1] finding of 8.6% visually impaired and 1.8% legally blind.[2]

It is unclear what factors led to worse initial examination findings in this previously reported cohort, although that cohort did not include optic pathway gliomas and the definition of visual impairment differed from the authors'[1] criteria. In the previous report,[2] visual impairment was defined as best-corrected visual acuity 20/40 or worse in the better-seeing eye (or 3 lines worse than vision appropriate for age), complete loss of vision in 1 eye, or a bitemporal or homonymous hemianopia. Nuijts et al defined visual impairment as best-corrected visual acuity more than 0.5 LogMAR (approximate Snellen equivalent of 20/70 or worse) in the better-seeing eye. Additionally, 53% of patients had visual field defects, in contrast with Nuijts et colleagues' finding of 28.1% of patients with visual field defects among those able to complete testing.[1,2] Sensitivities for detecting visual field defects may have been different between the 2 studies, as Nuijts et al included semiautomatic-static peritests and Behavioral Visual Field Screening Tests, while the Peragallo et al study did not. For patients capable of completing Humphrey Field Analyzer 24-2 Swedish interactive thresholding algorithm Fast or Goldmann visual fields, any scotoma was included in the Nuijts et al study.

The Peragallo et al study[2] found that pediatric patients with primary brain tumors had decreased vision-related quality of life in comparison with children without brain tumors or other brain pathology. Decreased vision-related quality-of-life scores among that cohort correlated with visual acuity and those who had worse visual acuities or who were legally blind had worse scores. Hopefully, Nuijts et al[1] will provide data regarding patient-reported outcomes and health-related and vision-related quality-of-life measures. The authors'[1] investigation supports the need for systematic ophthalmological evaluations of all children with brain tumors and may contribute to standardization and guidelines regarding timely referrals, examination procedures, and intervals for follow-up examinations in children with brain tumors.

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