American Journal of Ophthalmology Case Reports 1 (2016) 5–7

Contents lists available at ScienceDirect

American Journal of Ophthalmology Case Reports

journal homepage: http://www.ajocasereports.com/

Case report

Contact lens-related polymicrobial keratitis from *Pantoea agglomerans* and *Escherichia vulneris*

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ARTICLE INFO

Article history:
Received 11 November 2015
Received in revised form
29 December 2015
Accepted 4 January 2016
Available online 10 February 2016

Keywords:
Contact lens
Keratitis
Panotea agglomerans
Escherichia vulneris
Polymicrobial

ABSTRACT

Purpose: To report a case of polymicrobial keratitis caused by *Panotea agglomerans*, *Escherichia vulneris* and coagulase-negative *Staphylococcus* in a patient who cleaned their extended wear contact lenses with only tap water for 2 weeks.
Methods: Case report.
Results: An adult presented with a painful red eye after wearing the same contact lenses for two weeks. The patient admitted to taking the contacts out in the evening and cleaning them with tap water before reapplying them in the morning. Exam revealed a 2.5 mm paracentral corneal ulcer in the left eye. Culture results from corneal scrapings were positive for *P. agglomerans*, *E. vulneris* and coagulase-negative *Staphylococcus*.
Conclusions: This is the first report of *P. agglomerans* and *E. vulneris keratitis* in association with contact lens wear. Both strains of *P. agglomerans* and *E. vulneris* were pansensitive to all tested antibiotics.
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1. Introduction

Instruction on appropriate contact lens hygiene is important to reduce the risk of adverse events. One of the most significant complications of contact lens wear is microbial keratitis. Up to 65% of all new microbial keratitis cases are caused by contact lens wear [1,2]. The incidence of microbial keratitis is 0.1–0.2% in soft extended-wear contact lens users [3–5]. Contact lens-related complications and keratitis cost an estimated $175 million annually in the United States and involve more than 250,000 clinician hours [6].

2. Methods

A retrospective chart review was performed after bacterial cultures were identified from the microbiology department. Relevant clinical and microbiological data were reported. The patient has since been lost to follow up, so written consent to publish personal identifying information has not been obtained. For this reason, no personal identifiable information was included in this report.

3. Theory

We report a case of bacterial keratitis in a contact lens user secondary to *Pantoea agglomerans* and *Escherichia vulneris*, Gram-negative bacteria that are extremely rare in the human eye. A PubMed review did not yield any prior reports of bacterial keratitis associated with either of these organisms. In addition, this is the first report of the antibiotic sensitivities of *E. vulneris* in the setting of an ocular infection.

4. Results

An adult with no pertinent past medical or ocular history presented with a 2 day history of photophobia and a painful, red, swollen left eye that was matted shut. The patient had been a contact lens wearer for over 15 years and uses soft, extended-wear lenses. The patient admitted that in the 2 weeks prior to presentation they took their contacts out each night, washed them in tap water, and placed them in their case. In the morning, the patient would rinse them again with tap water before inserting them. It is

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http://dx.doi.org/10.1016/j.ajoc.2016.01.004
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unclear why the patient did not use the proper cleaning regimen that they had used for years prior to this episode. Her current contacts were less than 1 year old.

On presentation, visual acuities were 20/30 OD and 20/25 OS. Examination of the right eye was normal. Slit lamp examination of the left eye revealed 1+ diffuse conjunctival injection and a 2.5 mm round paracentral corneal epithelial defect inferiotemporal to the visual axis involving 20% of the stroma. The patient was started on ciprofloxacin hourly when awake and homatropine 2% every 8 h. There was no change in symptoms the following day, and vision had decreased to 20/60 OS. Corneal scrapings were sent for routine and fungal cultures. The cultures were positive for P. agglomerans, *E. vulneris*, and *Staphylococcus* sp. Antibiotic sensitivities showed *P. agglomerans* and *E. vulneris* pansensitive to all tested antibiotics and Staphylococcus sp. resistant to clindamycin, erythromycin, gentamicin and oxacillin. Fig. 1 shows gram staining and growth plates for *P. agglomerans* and *E. vulneris*. Complete antibiotic sensitivities are shown in Table 1. The patient was started on fortified vancomycin and tobramycin drops, alternating between the two every hour when awake. The symptoms and clinical exam improved over several weeks, antibiotics were tapered and visual acuity returned to 20/25. At the last examination, the patient had only minimal punctate epithelial defects in the area of the ulcer, and was recommended to use artificial tears.

The patient did not returned for schedule follow-up, but reported again to the emergency department several days later, with an increase in injection, photophobia and eye pain. Cultures were positive for *Propionibacter* and she was treated with clindamycin drops 50 mg/mL twice per hour when awake with symptom resolution. The patient did not return for further follow-up for several years, at which time visual acuity was 20/25 OS with punctate epithelial erosions overlying the area of the prior keratitis.

5. Discussion

Suboptimal contact lens hygiene is a pervasive problem—more than 50% of users have slept in their contacts or used expired or improper disinfectant solutions; 35% have washed their contacts in tap water [6]. Contamination of a lens case can occur rapidly, within two weeks [7]. Use of the same contact lens case for more than 6 months is associated with a significantly increased risk of moderate to severe infectious keratitis [8].

Biodiversity studies report the isolation of *P. agglomerans* in the microbiota of various plants and insects [9]. *P. agglomerans* is isolated very rarely as part of the normal human flora, but has been reported as part of the microbiota of the healthy conjunctiva [10]. The *Pantoea* identified by deep sequencing were not speciated further, but this genus contains pathogenic species which have been reported to cause infection in other tissues, including endophthalmitis [11]. Thus, case reports and case series are currently used to guide antibiotic choices when *P. agglomerans* is suspected. The largest series and review of ocular infection of *P. agglomerans* involved patients with endophthalmitis and demonstrated that *P. agglomerans* showed 50% resistance to ampicillin, 38% resistance to cefazolin, 22% resistance to ceftazidime and 0% resistance to tobramycin [11]. The use of tobramycin was a safe choice in this patient due to no documented resistance in prior ocular infections. However, extended-spectrum beta-lactamase (ESBL) producing non-ocular isolates of *P. agglomerans* have been reported [12].

Even rarer may be ocular infection with *E. vulneris*, an opportunistic pathogen of catheter-associated and wound infections [13–16]. To our knowledge, only one patient has been described with ocular involvement of *E. vulneris*—a child who wore daily contacts had asymptomatic colonization in a study looking at ocular microbiota in this subset of patients [17]. *Escherichia* spp.,

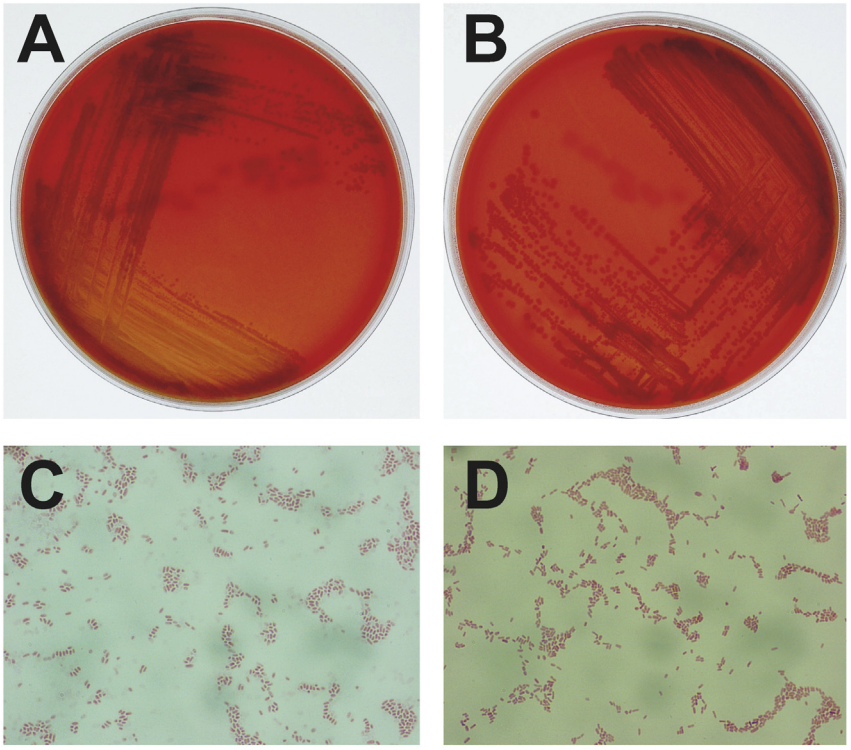

Fig. 1. *Pantoea agglomerans* and *Escherichia vulneris* isolates from a polymicrobial corneal infection. *P. agglomerans* (A and C) and *E. vulneris* (B and D) were isolated on 5% blood agar. The P agglomerans strain is beta-hemolytic (A), while the *E. vulneris* strain is not (B). Both strains are Gram-negative and form small, gray, mucoid colonies. These two organisms are difficult to distinguish from one another by Gram-stain and culturing alone. C and D magnification, 1000×.

Table 1
Complete Antibiotic Sensitivity Data: Results of strands tested against all antibiotics.

Antibiotic	*Pantoea agglomerans*	*Escherichia vulneris*	*Staphyloccus* sp.
Ampicillin	S	S	S
Aztreonam	S	S	S
Bactrim	S	S	S
Cefazolin	S	S	S
Cefotaxime	S	S	S
Clindamycin	S	S	**R**
Erythromycin	S	S	**R**
Gentamicin	S	S	**R**
Imipenem	S	S	S
Levofloxacin	S	S	S
Piperacillin	S	S	S
Tetracycline	S	S	S
Ticarcillin	S	S	S
Ticarcillin/ Clavulanate	S	S	S
Tobramycin	S	S	S

S = sensitive, R = resistant.

including *Escherichia coli*, were not identified in healthy conjunctiva microbiota in a recent deep sequencing study, but have been cultured from healthy conjunctiva [10,18]. *E coli* has been detected as part of the ocular microbiota following contact lens wear, but *E. vulneris* was not reported in this study [19]. Although *E. vulneris* in our patient was pansensitive to all tested antibiotics, multidrug-resistant *E. vulneris* infections and strains have been reported [15,20].

Proper contact lens hygiene is crucial to prevent keratitis. We have reported a case of two rare pathogens causing bacterial keratitis that will help guide antibiotic choices for future cases.

Financial and proprietary information

This study was funded, in part, by the National Institutes of Health (grant R01EY024140 to M.C.C.) and an unrestricted grant to the Dean A. McGee Eye Institute from Research To Prevent Blindness.

Conflict of interest

There is no conflict of interest to disclose.

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