Serrated Margins in *Pseudomonas aeruginosa* Keratitis

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Key Words

Pseudomonas aeruginosa keratitis · Serrated margins · Contact lenses

Abstract

Purpose: To describe 3 cases of culture-positive *P. aeruginosa* keratitis, who presented with a focus having serrated margins. **Methods:** Observational case report. **Results:** Three cases wearing contact lenses complained of symptoms such as pain, redness, and a decrease in vision. Slit-lamp biomicroscopic examination revealed a focus with serrated margins in all cases. The patients underwent corneal scraping for cultures, which confirmed the presence of *P. aeruginosa*. All 3 patients were treated with a combination of fluoroquinolone and tobramycin, 6–8 times per day. Corneal defects and infiltration disappeared within 2 weeks after initiating the therapy. **Conclusion:** Serrated margins may also be a characteristic initial presentation of *P. aeruginosa* keratitis.

Introduction

Pseudomonas aeruginosa is an environmental bacterium and a leading cause of infectious keratitis. *Pseudomonas aeruginosa* keratitis, triggered by contact lens wear or corneal trauma, can progress rapidly and lead to corneal scarring or melting with a profound impairment of vision. To minimize the damage to corneal tissue, it is critical to make an appropriate diagnosis and promptly initiate proper antibacterial therapy. Although microbiological evaluation of corneal scrapings is the gold standard for diagnosis, causative organisms cannot always be identified from a smear or identification may take several days. Thus, it is important to understand the clinical manifestations representative of the major pathogens. Ring abscess, which is a ring-shaped accumulation of polymorphonuclear leucocytes surrounding a central corneal lesion, is a well-known hallmark of *P. aeruginosa*

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keratitis [1, 2]. We report herein 3 cases of culture-positive *P. aeruginosa* keratitis, who presented with a focus having serrated margins.

Case Presentation

All cases wore contact lenses before displaying symptoms, which included pain, redness, and a decrease in vision. A 53-year-old female (Patient 1) visited a private clinic soon after complaining of symptoms in the right eye. Slit-lamp biomicroscopic examination revealed a focus with serrated margins. Corneal edema was absent at this point (fig. 1a). The patient was referred to our hospital on the next day, without receiving any antibiotic eye drops. The lesion enlarged, and a corneal epithelial defect and corneal edema were present (fig. 1b).

A 22-year-old male (Patient 2) and an 18-year-old female (Patient 3) visited a local hospital 2 days after noticing symptoms and were referred to our hospital on the same day. They presented with a large, round infiltrate, serrated margins, and accompanying epithelial defects (fig. 2a, b).

The 3 patients all underwent corneal scraping for smears and cultures. The direct smears showed many Gram-negative rods, and the culture reports confirmed the presence of *P. aeruginosa*. All isolates were sensitive to levofloxacin and tobramycin. The patients were treated with a combination of fluoroquinolone (1.5% levofloxacin for Patients 1 and 2; 0.3% gatifloxacin for Patient 3) and 0.3% tobramycin, 6–8 times per day. Corneal defects and infiltration subsided within 2 weeks after initiating the therapy. Although a slight corneal opacity remained, best-corrected visual acuity improved in all patients.

Discussion

Pseudomonas aeruginosa produces protease and elastase, which can induce the breakdown of collagen fibers, often leading to corneal melting and perforation. A ring abscess associated with prominent corneal edema is a hallmark of *P. aeruginosa* keratitis. The clinical presentation of our cases appeared to resemble fungal keratitis. In general, serrated margins of the main focus are commonly reported in association with keratitis caused by filamentous fungi [3]. Chaurasia et al. [4] reported satellite lesions with keratitis even when contact lenses were not worn. Patient 1 displayed serrated margins without strong corneal edema or melting corneal tissue soon after experiencing symptoms. Immune response is likely to be induced during the later stages of *P. aeruginosa* keratitis, and thus the initial presentation is associated with a more limited immune reaction such as corneal edema. A number of *P. aeruginosa* virulence factors may determine the clinical manifestations in the cornea [5]. The serrated margins may result from the effects of *P. aeruginosa* virulence mechanisms prior to the induction of an immune reaction. Although we investigated clinical records of 7 cases with keratitis caused by *P. aeruginosa* that was not contact lens-related, none of the cases showed serrated margins. Thus, lesions with serrated margins may be modified by contact lens wear. Since Patients 2 and 3 displayed serrated margins with infiltration 2 days after the symptoms appeared, serrated margins may have been present during the initial phase. Therefore, serrated margins, which have been described as a clinical feature of fungal keratitis, may also be a characteristic initial presentation of *P. aeruginosa* keratitis. In order to identify the factors causing serrated margins, virulence factors such as protease and elastase in isolates were checked. However, we did not find factors related to serrated margins. Since we report the additive activity of levofloxacin/tobramycin combinations in

more than 80% of the *P. aeruginosa* keratitis isolates [6], combined therapy with fluoroquinolones and tobramycin could be effective against *P. aeruginosa* keratitis with serrated margins.

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Disclosure Statement

The authors have no commercial or financial interests associated with this article.

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Fig. 1. Slit-lamp photograph of Patient 1 at day 0 (a) and day 1 (b) showing a lesion with serrated margins (black arrowheads).

Fig. 2. Slit-lamp photographs of Patient 2 (**a**) and Patient 3 (**b**) showing a lesion with serrated margins (black arrowheads) accompanied by round infiltration.