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Bilateral simultaneous infective keratitis

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ABSTRACT

Aim: To analyze the demographics, risk factors, clinical and microbiological characteristics of cases of bilateral simultaneous infective keratitis.

Methods: In this retrospective case series, patients with clinical evidence of bilateral simultaneous infective keratitis were identified from January 1, 2011 to August 31, 2016. Demographics, risk factors, clinical and microbiological characteristics, and treatment outcomes were analyzed.

Results: Five patients (ten eyes) with bilateral simultaneous infective keratitis were identified. The mean age was 32.8 years (SD, ± 8.8; range, 24–44). All the patients were disposable soft contact lens wearers before presentation. The average size of the infiltrate was 4.76 mm^2 (SD ± 9.0; range, 0.2–31.34). A total of 4 types of bacteria were isolated, with *Pseudomonas aeruginosa* being the most frequently isolated bacteria involving 5 eyes of four patients. Infection resolved with medical treatment in 9 eyes, 1 patient required therapeutic corneal transplantation for impending corneal perforation. The average time taken for infection to resolve was 6.7 days (SD ± 4.5; range, 2–16).

Conclusions: In this case series, the most common risk factor of bilateral simultaneous microbial keratitis was use of soft disposable contact lens and the most commonly isolated bacteria was *Pseudomonas aeruginosa*. Bilateral simultaneous infective keratitis is uncommon and is a serious complication of contact lens use in immunocompetent adult patients.

1. Introduction

Infective keratitis is a serious ocular infection that can potentially lead to severe visual dysfunction and is a major cause of blindness worldwide [1]. The outcome can be worse if there is bilateral simultaneous infective keratitis. Bilateral simultaneous infective keratitis in immunocompetent, healthy adults with no previous history of ocular surgery is rare and only six isolated cases have been reported in the literature [2–7]. Therefore, the aim of this study is to identify the demographics, risk factors, and clinical and microbiological characteristics of bilateral simultaneous infective keratitis.

2. Methods

In this retrospective case series, we identified all patients treated for bilateral simultaneous infective keratitis at the National University Hospital, Singapore, a tertiary referral center, between January 1, 2011 to August 31, 2016. All patients with clinical evidence of bilateral simultaneous infective keratitis were included. These patients had presented with symptoms of bilateral pain, redness, photophobia and blurring of vision. Clinical history was recorded in detail. Clinical diagnosis was made by an experienced corneal surgeon (RM). The patients were asked about any possible risk factors including contact lens use, ocular trauma, use of steroids or any immunocompromised state. Time of onset of symptoms to presentation to hospital was recorded. We followed the standard protocol for microbiological isolation [8]. All suspected infectious corneal infiltrates were scraped for microbiological studies before any treatment was initiated. Corneal smears were prepared for gram and fungal stain (KOH) with a spatula. Corneal samples were directly inoculated to blood and chocolate agar media for aerobic isolation, to Robertson cooked meat media for anaerobic and microaerophilic isolation and to Sabouraud's agar media for fungal detection. Bacterial isolates were identified by gram staining, colony characters and motility testing. All bacterial isolates were tested for their anti-microbial susceptibility by standard disc diffusion method against different antibiotics. The results of the susceptibility were recorded as resistant or susceptible. Bacterial culture was considered positive if two media had grown five or more colonies of a particular isolate or if growth in one media was associated with identification of same organism in gram stain. However, any fungal growth in one solid

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media was considered positive.

The study was approved by the institution's ethics committee (Domain Specific Review Boards, National Healthcare Group, Singapore). The research protocol adhered to the tenets of the Declaration of Helsinki for clinical research.

Demographics, presdisposing factors, and clinical and microbiological characteristic were reviewed from medical records. Clinical characteristics reviewed included the size and location of corneal infiltrate, presence of hypopyon, pre- and post-treatment best-corrected visual acuity, antibiotic regimen, duration of infection, and treatment outcomes. The size of infiltrate was measured in square millimeters at presentation, and the location was classified as central or peripheral. The central zone was defined as the central 3 mm in diameter, whereas peripheral zone refers to corneal infiltrate lying outside the central zone. Visual acuity was recorded using Snellen's visual acuity chart and converted into logMAR (logarithm of the minimum angle of resolution) acuity. All patients were initially treated empirically with topical cefazolin (50 mg/mL) and gentamicin (14 mg/mL), which were subsequently changed according to culture and sensitivity results if required. Microbiological characteristics reviewed included the types of isolated pathogens and their susceptibility to common antibiotics such as cefazolin, gentamicin, ciprofloxacin, and piperacillin. For statistical analysis, we used descriptive statistics using SPSS version 16.0 for MS Windows (SPSS Inc, Chicago, IL) software.

3. Results

From January 1, 2011 to August 31, 2016, a total of 430 cases of infective keratitis were seen. There were 5 patients (10 eyes) with bilateral simultaneous infective keratitis. Demographics, clinical and microbiological characteristics are summarized in Table 1. The mean age was 32.8 years (SD, ± 8.8; range, 24–44). There were 2 males and 3 females. Most of the patients were Chinese (n = 4). All patients wore soft disposable contact lenses. None of the patients had any significant past medical condition predisposing them to be immunocompromised nor any ocular trauma, surgery or use of immunosuppressive medication.

The mean size of corneal infiltrate was 4.76 mm^2 (SD, ± 9.0; range, 0.2–31.34). Infiltrates were located centrally in 8 eyes. Hypopyon was present in 3 eyes of 3 patients (Fig. 1). LogMAR visual acuity at presentation ranged from 0.12 to 2.3, with the mean being 1.0 (SD, ± 0.9). All patients were initially treated empirically with the standard protocol of topical cefazolin and gentamicin, and then subsequently the choice of antibiotic was dependent upon the culture results and susceptibilities. All patients were treated inpatient, and the average time taken for the infection to resolve was 6.7 days (SD, ± 4.5; range, 2–16). The LogMAR visual acuity after treatment ranged from 0.12-1.9, with the mean being 0.47 (SD, ± 0.6).

Table 1
Demographics, Risk Factors and Clinical Features in Bilateral Bacterial Keratitis.

	n
Gender	
Male	2
Female	3
Race/ethnicity	
Chinese	4
Indonesian	1
Mean age	32.8 years (SD, ± 8.8; range, 24–44)
Risk factors	
Disposable contact lens	10
Trauma	0
Ocular surface disorder	0
Use of steroids	0
Clinical characteristics	
Mean size of corneal infiltrate	4.76 mm^2 (SD, ± 9.0; range, 0.2–31.34)
Location of infiltrate	
Central	8
Paracentral	2
Hypopyon	3
Mean visual acuity (logMAR)	
At presentation	1.0 (SD, ± 0.9; range, 0.12–2.3)
After treatment	0.47 (SD, ± 0.6; range, 0.12–1.9)
Mean duration for resolution of infection	6.7 days (SD, ± 4.5; range, 2–16)

Two patients were bilaterally culture positive while 3 patients were positive in one eye. A total of 9 organisms belonging to 4 species of bacteria were isolated (Table 2). *Pseudomonas aeruginosa* was isolated in 4 patients. All of the isolated bacteria were gram-negative bacilli. The Gram and culture positivity rate was 50% and 70% respectively in our series. All the isolated bacteria were tested against a number of antibiotics and sensitivity results are shown in Table 4. All *P. aeruginosa* were susceptible to ceftazidime, gentamicin, ciprofloxacin, levofloxacin and piperacillin (Table 3). All other gram-negative bacteria were susceptible to cotrimoxazole. Medical treatment was successful in all except one eye that required therapeutic corneal transplantation due to impending corneal perforation (Fig. 2). The patient who underwent therapeutic corneal transplantation had presented late and grew *Pseudomonas aeruginosa* in that eye.

4. Discussion

Bilateral simultaneous infective keratitis is rare in immunocompetent adults with no previous ocular surgery or trauma. There have been sporadic case reports of bilateral infective keratitis in the literature mostly after various refractive surgeries and to the best of our knowledge; our case series is the largest one reported in the literature to date. Chehaibou I et al. reported a case of bilateral simultaneous infective keratitis two days after bilateral small-incision lenticule extraction (SMILE) procedure [9]. The causative organism was *Steptococcus pneumonia*. Ali N A et al. reported a rare case of bilateral polymicrobial infection with poor visual outcome in a young contact lens wearer involving three organisms [10]. Karimian F et al. published a case series of three patients who had developed bilateral keratitis after photorefractive keratectomy (PRK). *Staphylococcus aureus* was isolated in two patients while the third patient had grown *Steptococcus pneumonia* [11].

All patients were contact lens user before presentation and this could be the possible risk factor in this series. A high prevalence of myopia in Singapore [12] has led to an increase in the number of contact lens wearers. The risk of keratitis is significantly higher in contact lens users due to various factors such as poor hygiene, type of lens care solution and poor compliances [13]. In our series four patients used monthly disposable while one patient used bi-weekly disposable lenses. These lenses were silicone hydrogel lenses. Compliance was one of the major issues as majority of the patients used contact lenses for long hours and even admitted to have slept with them occasionally.

In previous case reports of bilateral simultaneous infective keratitis, *P. aeruginosa, Flavobacterium meningosepticum*, *Alkaligenes* species were also isolated. In our case series, 2 patients (2 eyes) had polymicrobial infection: one eye had *P. aeruginosa* and *S. maltophilia* and the other grew *Serratia marcescens* and *Bukholderia cepacia.*

P. aeruginosa was the most frequently isolated bacteria in our case series. It is the most common organism worldwide in contact-lens related keratitis [14] and the most common bacteria found in corneal ulcers among Singaporean patients [15]. In a recent study from Taiwan, Hsiao et al. had noted a shifting trend in bacterial keratitis when more gram-positive bacteria were isolated. However, *Pseudomonas aeruginosa* still remained commonest isolated bacteria in this study [16].

The limitations of our study include its retrospective design and small sample size. Nevertheless, our study is the largest cases series reported in the literature of bilateral simultaneous infective keratitis and highlights its demographics, risk factor and clinical features.