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BRIEF REPORT

Clinical Presentation and Microbial Analyses of Contact Lens Keratitis; an Epidemiologic Study

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Abstract

Introduction: Microbial keratitis is an infective process of the cornea with a potentially and serious visual impairments. Contact lenses are a major cause of microbial keratitis in the developed countries especially among young people. Therefore, the purpose of the present study was to evaluate the frequency and microbiological characteristic of CLK in patients referred to the emergency department (ED) of teaching hospitals, Babol, Iran. **Methods:** This is a cross-sectional study of all patients with contact lens induced corneal ulcers admitted to the teaching hospitals of Babol, Iran, from 2011- 2013. An ophthalmologist examined patients with the slit-lamp and clinical features of them were noted (including pain, redness, foreign body sensation, chemosis, epiphora, blurred vision, discomfort, photophobia, discharge, ocular redness and swelling). All suspected infectious corneal ulcers were scraped for microbial culture and two slides were prepared. Data were analyzed using SPSS software, version 18.0. **Results:** A total of 14 patients (17 eyes) were recruited into the study (100% female). The patients' age ranged from 16-37 years old (mean age 21.58±7.23 years). The most prevalent observed clinical signs were pain and redness. Three samples reported as sterile. The most common isolated causative organism was pseudomonas aeroginosa (78.6%), Staphylococcus aureus 14.3%, and enterobacter 7.1%, respectively. Treatment outcome was excellent in 23.5%, good in 47.1%, and poor in 29.4% of cases. **Conclusion:** Improper lens wear and care as well as the lack of awareness about the importance of aftercare visits have been identified as potential risk factors for the corneal ulcer among contact lens wearers. Training and increasing the awareness of adequate lens care and disinfection practices, consulting with an ophthalmologist, and frequent replacement of contact lens storage cases would greatly help reducing the risk of microbial keratitis.

Key words: Keratitis; contact lenses; ophthalmology, epidemiology, anti-bacterial agents

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Introduction:

Microbial keratitis is an infective process of the cornea with a potentially sight-threatening condition and serious visual impairments (1). Untreated or severe keratitis may lead to significant public health problems like perforation of cornea and endophthalmitis (2, 3). Contact lenses are a major cause of microbial keratitis in the developed countries especially among young people with about 12% hospitalized cases requiring corneal transplantation (4, 5). Contact lenses may reduce the epithelial barrier function by interfering with normal epithelial cell proliferation and differentiation. With the growth of soft contact lens wear, the incidence of this problem raised globally (3, 6). There are several differences in the incidence of contact lens keratitis (CLK) across the world (7). Pseudomonas aeruginosa can adhere to the surface of the contact lens and colonize during wear and survive in contact lens storage cases. These processes maybe lead to corneal ulcers; a severe infection can cause permanent blindness (8). Although corneal ulcer is a rare complication of contact lens wear, increasing in the number of lens wearers and the risk of blindness, provide important reasons to evaluate patients with contact lens induced corneal ulcers (9, 10). The number of contact lens wearers has dramatically increased in Iran, particularly among young adults in recent years. Therefore, the purpose of the present study was to evaluate the frequency and microbiological characteristic of CLK in

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patients referred to the emergency department (ED) of teaching hospitals, Babol, Iran.

Methods:

Study design and patients

This is a cross-sectional study of all patients with contact lens induced corneal ulcers who were referred to the ED of teaching hospitals, Babol, Iran, from 2011 to 2013. Patients were excluded from the study with a previous history of anterior segment surgery, treatment for ocular surface disorders, use of any topical ocular medications, or noninfectious corneal ulcers include autoimmune, neurotropic, toxic, and marginal keratitis. An ophthalmologist examined patients with the slit-lamp and clinical features of them were noted (including pain, redness, foreign body sensation, chemosis, epiphora, blurred vision, discomfort, photophobia, discharge, ocular redness and swelling). All patients wore soft contact lenses, either conventional daily or disposable extended wear contact lenses. The use of disinfection solution (hydrogen peroxide formulations) was also asked from patients and registered. Informed consent form was received from all participants.

Sampling, culture, and susceptibility tests

After a detailed ocular examination, all suspected infectious corneal ulcers were scraped for microbial culture and susceptibility studies initiated before treatment. After instillation of 0.5% proparacaine hydrochloride, two slides were prepared by an ophthalmologist for the direct microscopic examination using flame-sterilized Kimura spatula or a sterile 21 gauge needle, from the leading edge and the bed of the ulcer. The obtained materials were spread onto labeled slides for Gram and Giemsa stains and also inoculated using cotton swab applicators onto the surfaces of blood agar, chocolate agar, and sabouraud agar plates (for fungal infection assay). If bacterial growth was observed in the media, the culture considered as positive and the resistance to antibiotics determined by the Mueller-Hinton media, too. Results were interpreted according to the guidelines of the National Committee on Clinical Laboratory Standards (NCCLS) (11).

Visual acuity

Any reduction in vision was tested using Snellen letter charts and measured in comparison with the unaffected eye. However, when both eyes were affected, the amount of vision loss was calculated using the worse eye and a standard reference of 6/6 Snellen acuity. Similarly, if there was amblyopia in the unaffected eye, the standard reference of 6/6 was used for analogy. Visual acuity was categorized as no light perception (NLP), counting fingers (CF), hand motion (HM), loss of two or more lines, and no loss of vision.

Definitions

CLK is defined as a supportive corneal infiltrate and overlying epithelial defect with the recent history of contact lens use, with or without hypopyon. The ulcer size gives an estimate area of the ulcer to calculate the analysis more easily as follow: size of ulcer = length × breadth / mm^2. Disease duration was defined based on the number of days that symptoms were experienced. Duration of hospitalization was referred to the length of stay in hospital.

Visual outcome

When the corneal healing was not associated with visual loss, the visual outcome considered as “excellent”, in patients had < 2 lines loss of visual acuity as “good”; and for loss ≥ 2 lines or patients underwent penetrating keratoplasty as “poor”.

Statistical analysis

Data were analyzed using the SPSS statistical software version 18.0. Quantitative data were expressed as mean ± standard deviation and qualitative ones as frequency and percentage.

Results:

14 patients (17 eyes) were recruited into the study who all of them were female. The patients’ age ranged from 16-37 years old (with mean ± standard deviation 21.58±7.23). The mean lag time between the onset of symptoms and the first time patients referred to the ED was 48 hours. The mean treatment duration was 29±7 days in outpatient and 96±21 days in inpatient cases. 64.3% were treated outpatient, 28.6% admitted, and 7.1% needed surgical intervention. Keratitis involved the right eye in seven cases (41.2%) and the left eye in five ones (29.4%). Infection was bilateral in five patients (29.4%), too. All 14 patients were contact lens wearers; there were two cases (14.3%) of therapeutic contact lens and 12 (85.7%) of cosmetic lens users. Overnight lens users were noted in four referees. Four of the 12 (75%) cosmetic contact lens wearers were

Table 1: Clinical characteristics of patients with contact lens microbial keratitis

Sign and symptom	Number (%)
Pain and redness	14 (100)
Foreign body sensation	11 (78.6)
Chemosis	11 (78.6)
Epiphora	10 (71.4)
Decreased visual acuity	9 (64.2)
Hypopyon	5 (35.7)
Size of the corneal ulcer	
<3 mm^2	9 (52.9) eyes
≥3 mm2	8 (47.1) eyes
Visual acuity	
Hand motion	4 (28.6)
Finger count	4 (28.6)
>1/10 Snellen acuity	6 (42.8)
Causative organism	
Pseudomonas aeroginosa	11 (78.6)
Staphylococcus aureus	2 (14.3)
Enterobacter	1 (7.1)

using lenses of another person in time of the infectious event. All cosmetic contact lens wearers chose and wore their lenses without any consultation with ophthalmologists, and 10 (71.4%) subjects applied no disinfection regimen of contact lenses. The most prevalent observed clinical signs were pain and redness that reported in all patients. Table 1 shows the clinical characteristics of patients with CLK. The mean size of ulcer was 3.92±2.11 mm2. There were three samples reported as sterile. The most causative microorganism was pseudomonas aeroginosa (78.6%). Table 2 indicates the antibiogram results that 71.4% of the microorganisms were sensitive to ciprofloxacin, whereas ceftazidime, imipenem, and meropenem considered as the second most effective antibiotics. Treatment outcome was excellent in 23.5%, good in 47.1%, and poor in 29.4% of cases.

Discussion:

The most prevalent observed clinical signs were pain and redness and the most common causative microorganism of CLK was pseudomonas aeroginosa. Treatment outcome was excellent in 23.5%, good in 47.1%, and poor in 29.4% of cases. Mela et al. in a retrospective study reported 23 patients with contact lens-related keratitis. All of patients were using soft contact lenses from three days to 20 years (12). In a study by Malaysian National Eye Database Study Group, 202 patients were notified to the contact-lens related microbial keratitis registry with a mean age of 26.7 years (71.8% female), during 2007-2008, while all of them wore soft contact lens (13). Evaluation of 56 ulcerative keratitis subjects associated with contact lens wearing showed that contact lens-associated ulcers were seen in 86% of those wearing soft lenses (14). Benhmidoune et al. conducted a descriptive study of 51 patients presented to the ophthalmology hospital in Casablanca with contact lens-related microbial keratitis; the mean age of patients was 22 years, with a sex ratio of 7.5 female to male (15). In the present study all patients contacted with lens wearers and there were 2 and 12 cases of therapeutic contact lens and cosmetic lens users, respectively. The overnight and extended wear of contact lens is known as a risk factor for microbial keratitis (16). The microorganisms found from the corneal scrapes were not part of the ocular flora and their presence demonstrated that the source of contamination was external (17). It has been shown that some microorganisms including potentially pathogenic species can survive for hours on contact lenses and have harmful effects on the ocular surface (8). Here, it was found that Pseudomonas is the dominant causative agent in contact lens- related microbial keratitis, accounting for more than 75% of the culture-positive specimens. Previous studies revealed that Pseudomonas aeruginosa is the most common microorganism in contact lens-related microbial keratitis, followed by Gram-positive bacteria, fungi, and Acanthamoeba (12-15, 18, 19). Pseudomonas aeruginosa was the most frequent isolated pathogen in 60% and 79.7% of CLK cases of Mela et al. and Goh et al. study, respectively (12, 13). In Benhmidoune et al. study Corneal bacterial cultures were positive in 47.8% of subjects pathogens found were staphylococcus aureus, pseudomonas aeruginosa, and acanthamœba (15). Pseudomonas was the most common isolate, presented in 13 (23%) of the 56 cases in Galantine et al study (14). Staphylococcus species were the second most common pathogen in 11 (20%) of the 56 cases. Findings of the present study demonstrated on the importance of referral of all contact lens wearers with suspected corneal infection to ophthalmologists for further treatment. Improper lens wear and care as well as the lack of awareness about the importance of aftercare visits have been identified as risk factors for the corneal ulcer among contact lens wearers. Training and increasing the awareness of adequate lens care and disinfection practices of users, consulting with an ophthalmologist, and frequent replacement of contact lens storage cases would greatly help reducing the risk of microbial keratitis.

Conclusion:

Improper lens wear and care as well as the lack of awareness about the importance of aftercare visits have

Table 2: Antibiotic sensitivity and resistance pattern of microorganism isolated from corneal ulcers in patients with microbial keratitis ⇧

Antibiotic	Pseudomonas aeruginosa		Staphylococcus aureus		Enterobacter	
	Sensitive n (%)	Resistant n (%)	Sensitive n (%)	Resistant n (%)	Sensitive n (%)	Resistant n (%)
Penicillin	0 (0)	11 (100)	0 (0)	2 (100)	0 (0)	1 (100)
Ciprofloxacin	9 (81.8)	2 (18.2)	0 (0)	2 (100)	1 (100)	0 (0)
Gentamycin	0 (0)	11 (100)	2 (100)	0 (0)	1 (100)	0 (0)
Amikacin	5 (45.5)	6 (54.5)	1 (50)	1 (50)	1 (100)	0 (0)
Ceftazidime	9 (81.8)	2 (18.2)	0 (0)	2 (100)	1 (100)	0 (0)
Cefixime	0 (0)	11 (100)	0 (0)	2 (100)	1 (100)	0 (0)
Imipenem	9 (81.8)	2 (18.2)	0 (0)	2 (100)	1 (100)	0 (0)

been identified as potential risk factors for the corneal ulcer among contact lens wearers. Training and increasing the awareness of adequate lens care and disinfection practices, consulting with an ophthalmologist, and frequent replacement of contact lens storage cases would greatly help reducing the risk of microbial keratitis.

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