First contact diagnosis and management of contact lens-related complications

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Abstract

Purpose: To describe the spectrum of contact lens-related problems in cases presenting to a tertiary referral eye hospital.

Methods: A retrospective case record analysis of 111 eyes of 97 consecutive patients was undertaken over a period of five months at the Royal Victorian Eye and Ear Hospital, Melbourne, Australia. Contact lens-related complications were classified into microbial keratitis, sterile corneal infiltrates, corneal epitheliopathy and contact lens-related red eye (CLARE). Main parameters examined were nature of the first contact, clinical diagnosis, and management pattern.

Results: Forty-two percent of the initial presentations were to health care practitioners (HCPs) other than ophthalmologists. Mean duration from the onset of symptoms to presentation was 6.3 ± 10.9 days. Forty-nine percent ($n = 54$) of patients had an associated risk factor, most commonly overnight use of contact lenses ($n = 14$, 13%). Most common diagnosis at presentation was corneal epitheliopathy (68%) followed by sterile infiltrates (10%), CLARE (8%) and microbial keratitis (6%). No significant differences were found in the pattern of treatment modalities administered by ophthalmologists and other HCPs.

Conclusions: HCPs other than ophthalmologists are the first contact for contact lens-related problems in a significant proportion of patients. These HCPs manage the majority of contact lens-related complications by direct treatment or immediate referral.

<H1>Introduction

Contact lenses are commonly used for correction of refractive errors. Approximately 33 million (11.3% of the total population) people were using contact lenses in the United States in 2003 [1]. In Australia there are around 700,000 contact lens wearers (approximately 3% of the total population) [2]. Although contact lenses are considered safe, it is not rare for patients to develop contact lens-related problems particularly when contact lens care is not meticulous. It has been estimated that about 6–21% of contact lens wearers develop a contact lens-related complication each year [3, 4]. The severity of these problems can range from mild corneal epitheliopathy to vision-threatening microbial keratitis.

Patients who develop ocular symptoms whilst wearing contact lenses can present to a variety of health care practitioners (HCPs). Some of these are specifically trained in ophthalmic sciences and ocular health, such as ophthalmologists and optometrists. Other professions such as general practitioners, pharmacists and non-ophthalmic emergency physicians have much broader general training and may not have extensive experience in ocular health care. Although this shared care may decrease the patient load for ocular professionals and provide multiple access points for patients, there is a potential risk of compromising optimal management. We conducted a retrospective study to evaluate the first contact management profile of patients who were seen with contact lens-related complications (CLRCs) at a tertiary care hospital.

<H1>Methods

Data for this study were obtained by retrospective analysis of 111 eyes of 97 patients through review of files held in the Medical Records Department at the Royal Victorian Eye and Ear Hospital (RVEEH), Melbourne. The study was approved by the Human Research Ethics Committee of the hospital and followed the tenets of the Declaration of Helsinki. All patients who presented to the emergency department between February 2008 and June 2008 with contact lens-related complications were included in the study. CLRCs were identified by a coding system used in the

emergency department that assigns a diagnosis to each patient who presents to the emergency department.

Information extracted from the files included demographics, details of first contact consultations, presentation pattern, type of contact lens worn, risk factors for complications and management profile. Risk factors were recorded based on previous reports in the literature including overnight lens wear [5, 6], swimming with contact lenses [7], blepharitis and dry eye [1, 8], previous herpes simplex keratitis [9], and daily wear time >12 hours [10]. CLRCs were classified based on modified versions of previously documented classification systems [1]. The terms CLARE (contact lens-related red eye) and epitheliopathy were used as umbrella terms for a variety of conditions because of lack of detail in the case notes to make more specific diagnoses. We classified the diagnoses into the following categories—cornea, presumed microbial keratitis; cornea, sterile infiltrates; cornea, epitheliopathy; CLARE; and other, e.g., unable to remove contact lens, contact lens deposits, no abnormality.

Microbial keratitis was defined as an epithelial defect overlying an area of corneal stromal infiltration observed on slit-lamp biomicroscopy [6, 11]. For those with suspected microbial keratitis and infiltrates large enough for scraping, a detailed microbiological work-up was performed. Any treatment instituted was defined as ‘correct’ when the patient was advised to cease contact lens wear immediately for all conditions. In addition to this, for each specific condition the following management protocols were considered as correct and/or standard based on previous suggested therapies in the literature [1]: Presumed microbial keratitis—patient advised to use broad-spectrum fluoroquinolone or fortified topical antibiotics at a minimum of two hourly frequency; sterile infiltrates—patient advised to use lubricants, topical antibiotics and/or steroids; epitheliopathy—patient advised to use lubricants or topical antibiotics; or CLARE—patient advised to use lubricants, topical antibiotics, steroids or no treatment.

Patients who were referred to an ophthalmologist for immediate management were also considered 'correct' management.

<H1<Statistical analysis

The chi-squared test was used to assess the association of vision as a determinant of speed of presentation. The proportion of each of the treatment regimes applied by the ophthalmologists and other HCPs and the first presentation of eyes diagnosed with and without microbial keratitis were compared by using test of proportions. The statistical software, SPSS version 16.0.1 (SPSS Inc, Chicago, IL, USA) was used to perform the analyses. The type of HCP first consulted and the diagnosis of contact lens-related complications were presented graphically by using Microsoft Excel (MS Office 2003).

<H1>Results

Of the 111 eyes of 97 patients examined, 14 had bilateral involvement. There were 72 females and 25 males ($p < 0.001$). The mean age of patients was 33.0 ± 11.7 years (range 13.0–66.5 years). As demonstrated in Fig. 1, 58% of patients seen at our emergency department had not previously seen any other HCP. Data for the duration between the onset of symptoms and first presentation were available for only 65 patients. The mean time to presentation for this subgroup was 6.3 ± 10.9 days (min <24 hours, max 60 days). We analysed the group that presented to our centre first to determine if vision was a determinant of speed of presentation. Patients were grouped into two categories—those with vision better or equal to 6/9 (Snellen acuity) and those with vision of 6/12 or worse. There was no statistically significant difference between these groups with regards to the time to presentation (Table 1).

Table 2 details the risk factors identified in our cohort of patients. About half of the patients (57/111; 51%) did not have documentation of any known risk factors for contact lens complications. Most common associated risk factor was overnight use of contact lenses (14/111;

13%) followed by prolonged daily wear of contact lenses (12/111; 11%) and dry eyes (9/111; 8%). Figure 2 shows the relative spread of diagnoses in patients. Corneal epitheliopathy was the most common diagnosis at the time of presentation (75/111; 68%). Overall, seven cases were diagnosed to have presumed microbial keratitis. Of these, only three were considered large enough to scrape for microbiological investigation; none of these three cases demonstrated microbial growth on cultures. Table 3 is an analysis of the presentation and treatments for each condition. No statistically significant difference between the treatment provided by the other HCPs and ophthalmologists was noted. Two of the four cases of presumed microbial keratitis that presented to other HCPs were referred directly for ophthalmological review. There was one patient who was placed on four times/day chloramphenicol only and was not advised to stop contact lens wear. Although this patient retained 6/6 vision at the last review appointment, the cornea had a residual scar.

On analysis of the patients with presumed microbial keratitis, there was no statistically significant difference between the patterns of presentation in these patients compared to those with other diagnoses (Table 4).

<H1>Discussion

Contact lenses and the adjunctive lens hygiene agents have undergone significant changes in manufacturing, materials and design over the past two decades. However, newer materials such as silicone hydrogel lenses or better accessibility do not guarantee an enhanced safety profile [5]. This study was initiated to investigate the management of complications using contemporary lens products and strategies. The majority of contact lenses are dispensed by the HCPs other than ophthalmologists. This is the reason why many of the cases present to the optometrists and non-ocular HCPs initially. Although many of these cases are managed successfully, we undertook this study to analyse whether there is any difference in the management of cases specifically with CLRCs by the ophthalmologists and other HCPs.

In our study more than half of the patients reviewed at our emergency department had not previously seen another HCP. This is most likely a reflection of the awareness of the community to the presence of a dedicated eye hospital. In communities without such a facility it is reasonable to assume that most of these patients may primarily be seen by a combination of optometrists, general practitioners and general hospitals. Previous studies have shown that eye complaints account for 2.8% of a general practitioner's case load [12]. A proportion of these will be related to contact lens use. Given the high number of patients who presented to our emergency department as a primary care centre, the numbers presented in our study are likely to be more representative of the true population spread of diagnoses related to CLRCs. However, due to the nature of data collection through a referral hospital in a retrospective case series and small sample size, there may be an inherent bias towards detecting more difficult conditions and it is likely there are many cases successfully managed in the community that do not present to our hospital. This would be problematic if the data demonstrated a difference between ophthalmologists and other HCPs. Our study, however, showed that other HCPs were able to effectively manage CLRCs, either by self-initiated management or immediate referral.

The average time to presentation was 6.3 days in our study, with a wide range of presentation times. When we analysed the presentation patterns based on visual acuity, we found no statistically significant correlation between severity of visual impairment and speed of presentation. This may be because these patients are accustomed to reduced vision once their contact lenses are removed. Due to limitations in data availability, this study did not look specifically at the relationship between speed of presentation and quantified pain or distress scores.

Previous studies have shown that overnight contact lens wear and the use of extended wear contact lenses are associated with an increased risk of microbial keratitis [4] and corneal infiltrative events [5]. Almost half (49%) of the patients in our study had some risk factor for development of CLRCs.

Overnight lens wear was the most commonly identified risk factor (13%). As this was a retrospective case series, it is certainly possible that this number has been under reported. It remains important that patients are educated about risks and counselled to minimise at-risk behaviour where possible.

The majority of presentations were due to corneal epitheliopathy (68%). This may either be related to prolonged and excessive contact lens wear, insertion technique, tear film instability, inappropriate contact lens fit or allergy. Most of these cases were adequately managed by the ophthalmologists and other HCPs through cessation of contact lenses and administering a lubricant or chloramphenicol. Similar recommendations have been made in the UK by Radford and colleagues [6] who estimated that a high proportion of hospital-presenting complications of contact lens use could be successfully managed in the community. A hospital-based study performed in the United Kingdom identified an incidence of 22% for microbial keratitis from referrals [13]. In comparison only 6.3% of our patients were diagnosed with microbial keratitis. In another report from Australia and New Zealand, 41% of patients presented to an optometrist, 34% to a general medical practitioner and 23% to the hospital emergency department. Optometrists showed a preference for referring to private rather than hospital clinics for treatment whereas the general practitioners referred to comparatively few ophthalmologists [2].

Symptoms alone may not distinguish non-serious and serious pathologies and it is important that contact lens wearers with ocular symptoms present promptly for assessment. An earlier study by Keay et al. commented that 33% of patients with contact lens-related microbial keratitis experienced a delay of >12 hours before they could receive appropriate treatment and this was primarily related to receiving inadequate treatment by other HCPs (such as topical chloramphenicol) [2]. This did not, however, correlate to a poorer long-term visual prognosis but did increase the burden of disease with regards to duration and cost. Although our study was not designed to look at this subset and was thus underpowered in this regard, our results paralleled

those of Keay et al. Delays in implementation of correct treatment for microbial keratitis have been associated with prolonged disease duration [14]. Although the present study was not powered sufficiently to fully investigate treatment delays, there was one case of mismanagement and this is consistent with the trends reported by Keay et al. [2].

Thus, although it is appropriate for patients to be seen first by the general practitioners and/or optometrist, any evidence of corneal opacity, progression despite treatment, or concern regarding diagnosis, should warrant urgent ophthalmic referral. The relatively delayed presentation of our patients with microbial keratitis highlights the importance of patient vigilance and education about early presentation. The need for immediate assessment and treatment of microbial keratitis by an ophthalmologist must be balanced against the cost of immediate ophthalmic review of all contact lens wearing patients with ocular symptoms. Our data shows that the vast majority of complications were non-vision threatening and were adequately handled by non-ophthalmic HCPs. Ophthalmic HCPs (such as optometrists) with experience in slit-lamp biomicroscopy are appropriate practitioners for management of non-microbial keratitis contact lens complications. Features of microbial keratitis such as diminished vision, corneal opacity or progressive deterioration should prompt urgent ophthalmologist referral. A recent study has shown that the incidence of microbial keratitis in Australia varies from 1.9 (daily disposable contact lens wear) to 25.4 (overnight wear soft contact lens wear) per 10,000 contact lens wearers per year [15]. Another study identified progression of symptoms after ceasing contact lens wear as being associated with microbial keratitis [16]. Better collaboration between HCPs and specialists, and use of resources are important to optimise rapid diagnosis and treatment.

The present study is limited by a small sample size. Although we did not find any significant differences between the 'good vision' and 'poor vision' groups as shown in Table 1, we suspect that a larger study over a longer time period may do so. The study design did not permit us to look for

other interesting risk factors such as use of daily disposables, soft versus silicone hydrogel or compliance (hand washing, lens case habits). Furthermore, our study does not provide information on management outside the hospital system but provides information on the management spectrum of contact lens-related conditions presenting at the hospital since this was the primary objective of the study.

Our study showed that the majority of presentations of patients with contact lens-induced symptoms are non-vision threatening. If the HCP lacks clinical experience in ophthalmic complications of contact lenses or the patient demonstrates failure to respond to treatment, decreasing vision or evidence of a corneal opacity, these should be strong indications for seeking an urgent ophthalmic referral given the possibility of corneal scarring or microbial keratitis.

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Fig. 1 Pie-chart depicting the place of first presentation of patients with contact lens-related problems

Fig. 2 Bar diagram showing the initial diagnosis in patients with contact lens-related problems

Table 1 Relative proportion of people who presented to the Royal Victorian Eye and Ear Hospital within 24 hours of symptom onset

	Presented within 24 hours (n; %)	Presented after 24 hours (n; %)	p*
Vision 6/9 or better (n = 46)	15 (33%)	31 (67%)	0.22
Vision 6/12 or worse (n = 19)	10 (53%)	9 (47%)	

*p-Value based on chi-squared test

Table 2 Risk factors for contact lens related complications

Predisposing risk factor	No. of eyes

	(<i>n</i> = 111)
None	57
Overnight wear of contact lens	14
Prolonged daily wear (wear >12 hours/day)	12
Dry eye	9
Blepharitis	6
Swimming with contact lens	2
Previous herpes simplex keratitis	2
Other, e.g., poor hygiene practices, previous laser-assisted in situ keratomileusis, viral conjunctivitis, persistent wear despite discomfort	9

Table 3 Profiles of patients presenting primarily to an ophthalmologist compared to those who presented to a non-ophthalmic HCP

Patient characteristics	Ophthalmologists (<i>n</i> ; %)	Other HCPs (<i>n</i> ; %)	<i>p</i> -Value
Number of patients	68	45	
Average age of patient	34.8 years	30.9 years	
Gender of patient	48 (70.6%)	33 (73.3%)	0.92
Females			
Males	20 (29.4%)	12 (26.7%)	
Presence of risk factors for CLRCs*	26 (38.2%)	18 (40.0%)	0.85
Patients managed correctly according to diagnosis			
†Presumed microbial keratitis	3/3 (100%)	3/4 (75%)	—
Sterile infiltrates	6/7 (86%)	5/5 (100%)	0.31
Epitheliopathy	41/45 (91%)	23/25 (92%)	0.97
CLARE#	7/7 (100%)	4/6 (66%)	0.11

*CLRC = contact lens-related complications

#CLARE = contact lens-associated red eye

Table 4 Comparison of patients with and without presumed microbial keratitis

	Eyes with presumed microbial keratitis (<i>n</i> = 7; 6.3%)	Eyes with other diagnoses (<i>n</i> = 104; 93.7%)	<i>p</i> †
*Mean time	4.86 ± 4.81	7.27 ± 10.58	0.77

††Extended wear lens	71%	85%	
Place of first presentation			
Optometrist	43%	15%	0.14
Eye hospital	43%	62%	0.33
General practitioners	14%	16%	0.89
Risk factors	Present in 43%	Present in 36%	0.72

*Duration of symptoms prior to presentation to our centre (days); †*p*-Value based on test of proportion for each individual place of presentation or type of lens. ††Patients who did not specify type of lens were presumed to be wearing extended wear soft contact lenses