

CONTACT LENS RELATED CORNEAL ULCER

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ABSTRACT

A corneal ulcer caused by infection is one of the major causes of blindness worldwide. One of the recent health concerns is the increasing incidence of corneal ulcers associated with contact lens user especially if the users fail to follow specific instruction in using their contact lenses. Risk factors associated with increased risk of contact lens related corneal ulcers are: overnight wear, long duration of continuous wear, lower socio-economic classes, smoking, dry eye and poor hygiene. The presenting symptoms of contact lens related corneal ulcers include eye discomfort, foreign body sensation and lacrimation. More serious symptoms are redness (especially circum-corneal injection), severe pain, photophobia, eye discharge and blurring of vision. The diagnosis is established by a thorough slit lamp microscopic examination with fluorescein staining and corneal scraping for Gram stain and culture of the infective organism. Delay in diagnosing and treatment can cause permanent blindness, therefore an early referral to ophthalmologist and commencing of antimicrobial therapy can prevent visual loss.

Keywords: Contact lens, corneal ulcer, diagnosis, prevention.

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INTRODUCTION

The use of contact lens was first reported in 1887.¹ Since then, it has developed into a dynamic industry. Hard contact lens came into the market in 1950s, followed by soft contact lens in early 70s and rigid gas permeable lenses in late 70s.¹ New types of contact lens have been developed over the past 10 years (Table 1). Today, it is estimated that more than 85 million people are using contact lens worldwide. One of the recent health concerns is the increasing incidence of corneal ulcers associated with contact lens user especially if they do not follow the proper instruction or strict regimens in using their contact lenses. Corneal ulcer caused by infection is one of the major causes of blindness worldwide. There are many predisposing factors associated with the development of corneal ulcers. Colonization of bacteria on the contact lens will eventually lead to corneal infection (keratitis) and ulcer formation. If the condition is serious, it will cause permanent visual loss. This is a significant public health concern for the

regular contact lens user and the incidence of this problem is expected to rise in the near future.

Incidence of contact lens related corneal ulcers

The incidence of microbial keratitis is approximately 2/10,000 per year for rigid contact lens user, 2.2-4.1/10,000 per year for daily-wear soft contact lens and 13.3-20.9/10,000 per year for extended-wear soft contact lenses.² In Malaysia, it was reported 78.9% of contact lens related corneal ulcer has positive organism culture.³ In another study it was found 78.1% of the corneal ulcers were colonized by Gram negative bacteria.⁴

Risk factors consistently associated with increased risk of ulcer formation among contact lens user are overnight wear, the duration of continuous wear, lower socio-economic class, smoking and lens hygiene practice. Men seem to be at a slightly higher risk compared to women; similarly smoker has

Table 1: Common types of contact lens and their features

- o Hard lens: Firm polymer material, more lasting and easy to clean but it can cause reduce oxygen flow to the cornea.
- o Soft lens: Softer in consistency, made of hydrogel. Permit a better delivery of oxygen to the cornea but has a risk of irritation and bacterial contamination.
- o Rigid gas permeable (RGP): Has both the features of hard and soft lens.
- o Extended-wear lens: soft contacts for continuous wear up to 30 days.
- o Others: Cosmetic contact lenses purely for cosmetic or colour of the cornea. Corneal reshaping lenses used to correct refractive errors, but must be fitted by trained professionals.

a higher incidence of corneal ulcers compared to non-smoker.^{5,6}

Pathogenesis of contact lens related keratitis

A corneal ulcer develops when there is a break in the corneal epithelium. In the normal eye, the surface of the cornea is constantly lubricated by the tear film. The tears play a major role in delivering adequate oxygen to the cornea besides maintaining moisture environment. Studies have shown that continuous overnight use of contact lens is a major risk factor for corneal ulcer formation.^{6,10,11} During sleep when the contact lens is *in situ*, the flow of tears and the oxygen delivery to the cornea are impaired causing hypoxia and hypercapnia of the corneal epithelium, resulting in ischemic necrosis. In one study, it was found that the relative risk for overnight contact lens wear (for any lens type) was 5.4 times higher than non-contact lens user.¹⁰ Superimposed bacterial infection especially with *Pseudomonas aeruginosa* can be very severe and can lead to permanent visual loss within 24 hours if it is not treated promptly.¹²

A bacterial infection of implants involves a complex mechanism related to biofilms formation. Collections of micro-organisms on natural or implanted surfaces are known as biofilms. They can form on natural surfaces like heart valves or implanted surfaces like intraocular lens and contact lenses.⁷ This biofilms enhances the adhesion of the microbe to smooth surfaces like cornea and other cells and they also promote the exchange of nutrients and waste products. *Pseudomonas aeruginosa* is one of the best known bacteria which are capable to form biofilms in ocular infection.⁸ Other possible infective agents causing corneal ulcers are listed in Table 2.

Table 2: Microorganisms associated with infective corneal ulcer^{3,4,13-15}

<i>Pseudomonas aeruginosa</i>
<i>Staphylococcus aureus</i>
<i>Streptococcus pneumoniae</i>
<i>Fusarium sp.</i>
<i>Acanthamoeba sp.</i>
<i>Acinetobacter baumannii</i>
<i>Corynebacterium sp.</i>
<i>Klebsiella pneumoniae</i>

Dry eyes are a common symptom experienced by contact lens user. The rate of tear film evaporation is higher among contact lens user in normal humid condition, which contributes to the contact lens induced dry eyes.⁹ Other known factors predisposing to corneal ulcer formation are the lens material, lens design, lens wearing schedule; lens care patterns and personal hygiene, severe allergy, immunosuppressive state and male gender (Table 3).¹⁰

Table 3: Predisposing factors for corneal ulcer in contact lens user^{9,10}

Contact lens factor	Overnight use Improper handling Lens material or design Contaminated lens cleanser
Personal factor	Hygiene problem Immunosuppressive state Allergy Chronic dry eye Male Smoker

Presenting symptoms of contact lens related corneal ulcer

The presenting symptoms of corneal ulcers vary from patient to patient depending on the severity of the ulcer and also how soon the patient seeks treatment. Early symptoms include eye discomfort, foreign body sensation, swollen eye lid and watering of the eyes. More serious symptoms are redness (especially circum-corneal injection), severe pain, photophobia, eye discharge and blurring of vision. Hypopyon (pus in the anterior chamber) may occur in severe cases and if patient presents late to the clinic.

Ocular signs of contact lens related corneal ulcer

Corneal ulcer is a serious problem which can lead to blindness if treatment is delayed. Superficial examination of the eye may only show injected conjunctiva, tearing or oedematous cornea. It is difficult to see subtle pathology of the corneal surface by torch light or direct ophthalmoscopy examination. Therefore, all patients who are suspected of a corneal ulcer should be referred to ophthalmologist for a complete eye evaluation. Corneal ulcer is best visualized with a slit lamp microscope after the cornea is stained with fluorescein dye. Among other findings seen in contact lens users is giant papillary conjunctivitis, keratoconjunctivitis, punctate epithelial erosions, epithelial splitting, punctate staining by soft lenses, corneal striae, corneal wrinkling and corneal neovascularization.¹³ Visual acuity of the patient must be documented as part of the evaluation of the progress following treatment.

INVESTIGATION

Corneal scrapping to obtain epithelial samples for Gram stain and culture and antibiotic sensitivity study is mandatory in all suspected infective cause. Common infective agents associated are listed in Table 2. The contact lens solution in the carrying box should also be sent for Gram stain and microbiological testing.

TREATMENT

The most important step in the management strategy for contact lens related ulcer is to remove the contact lens once suspected of corneal ulcer or infection. The actual treatment of the corneal ulcers and infections depends on the underlying aetiology. Prompt treatment is necessary for all types of corneal ulcer to prevent permanent visual loss. Usually it requires intensive topical antibiotic/antifungal therapy and systemic antibiotic/antifungal in selected cases such as aminoglycosides (gentamicin, tobramycin) and fluoroquinolone.¹⁶ Sensitivity profile must always be reviewed during the course of treatment based on culture results.

Prevention of contact lens related ulcer

Patient education remains one of the most important aspects of prevention of contact lens related corneal ulcers. Contact lens user must be counselled regarding the proper lens care, duration of usage and eye hygiene care. User of contact lens must get the correct lenses from authorized eye care professionals. Individuals with known risk factors of developing corneal ulcers must be cautious in using contact lens. Wearing contact lenses for a longer period of time and wearing it over night must be avoided. Even if a person is using the extended wear contacts, studies had proven that the risk of serious eye infection was higher.^{10,11} Conditions which can lead to dryness of the eyes such as antihistamines, environmental dust, smoke and irritants must be avoided. Contact lens users must be advised that if they experience any unusual symptoms following the use of contact lens such as irritations, redness or discomfort, they must remove the contact lens and seek proper evaluation and treatment as soon as possible.

CONCLUSION

With the increasing popularity of contact lens wear, contact lens related corneal ulcer is becoming more prevalent. Early diagnosis and treatment is paramount to prevent permanent visual impairment. All cases of suspected corneal ulcers seen in the primary care clinic should be promptly referred to ophthalmologist for confirmation and early treatment to prevent permanent visual loss.

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Editor's note: See page 46 for multiple choice questions based on this article.

MDI with spacer is equivalent to nebuliser for adults and children with acute asthma

Cates CJ, Crilly JA, Rowe BH. Holding chambers (spacers) versus nebulisers for beta-agonist treatment of acute asthma. *Cochrane Database Systc Rev*. 2006, Issue 2. Art. No.: CD000052. DOI: 10.1002/14651858.CD000052.pub2.

In both adults and children, there was no statistical significant difference in the admission rates. In children, length of stay in the emergency department was significantly shorter when the spacer was used (about half and hour less). Peak flow and forced expiratory volume were also similar for the 2 delivery methods. Pulse rate was lower for spacer in children (about 6% less).