

Infectious Complications of Contact Lenses: A Review of the Literature

Type of article: Review

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Abstract

The use of contact lenses is very common, they are prescribed for the correction of refractive errors that cannot be treated by glasses such as aphakia, keratoconus and strong anisometropia, or as alternatives to glasses. Contact lenses can cause serious complications that are not always easy for patients to manage [1]. Infectious complications in contact lens wearers are a real diagnostic and therapeutic emergency. These infections can be bacterial, amoebic (due to wearing contact lenses in swimming pools, rinsing lenses with tap water or saliva), fungal (due to wearing therapeutic, cosmetic or aphakic lenses, diabetes, alcoholism, immunosuppression, corticosteroids). Infectious complications require emergency treatment. The first line of treatment consists of removing the contact lens and sending it, along with the lens case and lens care product, to the laboratory along with corneal samples and appropriate medical treatment. Infectious keratitis related to contact lens wear is serious and can permanently affect the visual prognosis. The prevention requires a fitting under medical supervision and an awareness of the patients with potential risks of infection.

Key words: Infection, keratitis, Contact lens, abscess.

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1. Introduction

The use of contact lenses is very common [1, 2], they are prescribed for the correction of refractive errors that cannot be treated by glasses such as aphakia, keratoconus and strong anisometropia, or as alternatives to glasses. They have also contributed to the improvement of the quality of life not only by correcting refractive errors, but also by providing a better appearance.

Unfortunately, contact lenses can lead to serious complications that are not always easy to manage for patients.

2. Clinic

Infectious complications in contact lens wearers are becoming more and more frequent. They constitute a real diagnostic and therapeutic emergency. The risk factors [1, 2] are mainly: poor hygiene, permanent wear, contamination of cleaning solutions and swimming pool visits.

3. Etiologies and treatment

The etiologies of infectious keratitis can be bacterial, fungal or amoebic [1].

3.1 Bacterial keratitis is due to poor hygiene associated with the wearing of contact lenses. It has a sudden onset and is characterized by a red and painful eye, with erythema and edema of the eyelids and more or less purulent secretions. The decrease in visual acuity depends on the location of the abscess. Bio-microscopic examination [1, 2] shows conjunctival hyperemia, chemosis, epithelial ulceration overlying a grayish-white stromal infiltrate and a Tyndall ++ (in severe forms it is a hypopyon with fibrinoid aqueous humor).

Several germs can cause bacterial keratitis, the most frequent being *Pseudomonas*, *Staphylococcus aureus*, *Streptococcus Pneumoniae*, and *Streptococcus Epidermidis*. The prognosis depends on the aggressiveness of the pathogenic strain and the length of time between the onset of the infection and the start of treatment

A distinction is made between gram-negative bacterial keratitis; those due to gram-negative bacilli are more frequent (Fig. 1, 2, 3), gram positive cocci are rare [1], and gram-positive bacterial keratitis represented by gram-positive cocci (Fig. 4, 5a, 5b), and damage due to gram-positive bacilli is rare but serious.

Antibiotic-based treatments combining one or more antibiotics [1] (depending on the severity of the condition) are generally prescribed as soon as possible, and then adapted to the germ as soon as the antibiogram is available.

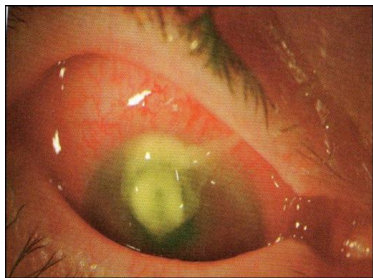


Fig1: Infection with *Pseudomonas Aeruginosa* (Pyocyanic bacillus) lenses+++ creamy and Necrotic infiltration of the stroma.

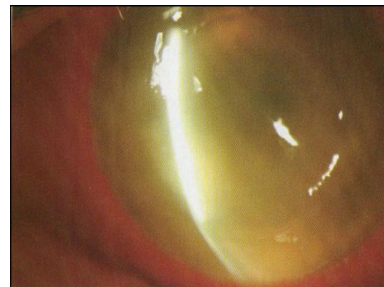


Fig2: Total abscess of the cornea by *Pseudomonas Aeruginosa*. Possible perforation



Fig3: Favorable evolution of *Pseudomonas Aeruginosa* keratitis under treatment; corneal scars

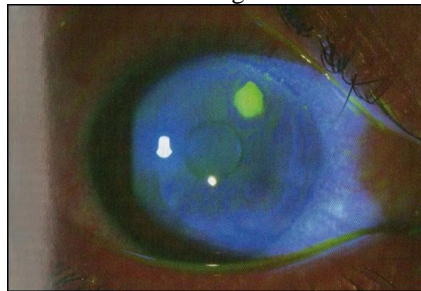


Fig4: Sharp-edged infiltrate of cream grayish-white staphylococcal keratitis, surmounted by an epithelial defect, Tyndall. Evolution: stromal suppuration



a. Massive corneal infection. Deep abscess, hypopyon, altered overlying epithelium with irregular borders



b. Acute unfavorable evolution within 24 hours despite intensive ATB initiated in emergency

Fig5: *Pneumococcus*

3.2 Fungal keratitis is rare but serious and difficult to manage. Filamentous fungi or yeast may be involved.

Filamentous fungus keratitis has a less acute onset [1] than bacterial keratitis, with patients presenting with a painful red eye, photophobia, and decreased visual acuity depending on the site of the lesions. Slit lamp examination shows a central corneal infiltrate with irregular margins, moderate stromal inflammation (Fig 6, 7), sometimes associated small satellite abscesses and black pigmentation at the bottom of the ulcer. A Tyndall and a hypopyon (Fig8) are found in 19 % (Alfonso, 2006b, Cohen, 2006) [1] of cases, endothelial fibrin plaques and a grayish epithelium evolving towards a large ulceration can be found (Fig9). The evolution is rapidly towards corneal perforation and endophthalmitis (Rosenberg, 2006) (Fig10) [1].

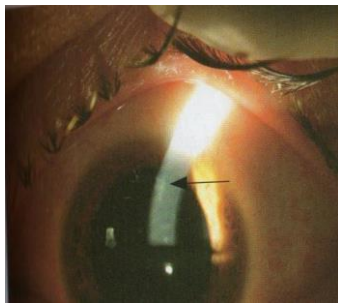


Fig6: Early Fusarium infection

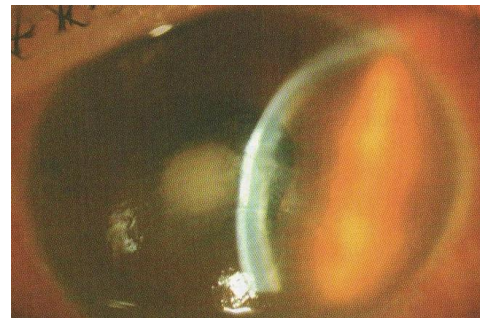


Fig7: Aspergillus central abscess



Fig8: Fusarium abscess
Association of a hypopyon

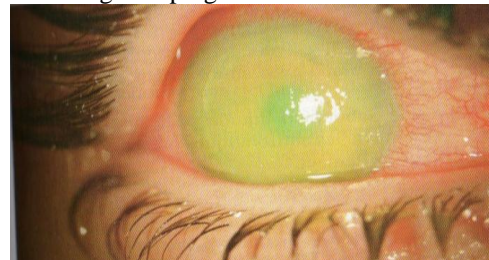


Fig9: Fusarium infection started 3 weeks ago



Fig10: Recurrence of a Fusarium infection on a hot corneal graft

Yeast infections or candidiasis are observed during therapeutic lens wear, they occur on weakened corneas, their onset is insidious and slowly progressive. Slit lamp exam reveals an ulcer [1, 2] in the form of a plaque with clear edges (Fig. 11). The lesions may be multiple, white-yellow, surrounded by stromal edema. The evolution is towards radial descemetic folds and endothelial plaque.

Few therapeutic options for the management of fungal keratitis, first of all the discontinuation of local corticosteroids is required before proceeding with epithelial debridement, as the penetration of topical antifungals into the corneal stroma is usually poor. In cases of severe infection, systemic antifungals or intrastromal injections of antifungals are used.

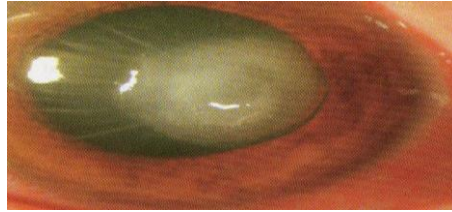


Fig11: Deep corneal candida abscess with endothelial reaction

3.3 Amebic keratitis is a rare and serious corneal infection that threatens the functional prognosis of the eye. A distinction is made between superficial and deep forms.

In superficial forms, the clinical presentation is very variable, the symptomatology is often very noisy at the beginning, intense pain, photophobia [1], lacrimation contrasting with moderate epithelial lesions (Fig12), radial keratoneuritis being found in more than half of the cases at the beginning of the infection would be due to an infiltration of the corneal nerves under the epithelium which explains the nervous tropism of the parasite (Fig13, 14, 15). (Fig13, 14, 15)

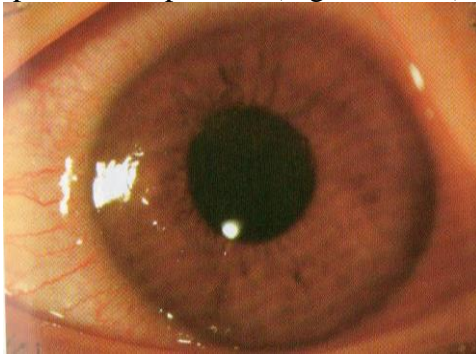


Fig12: Very important pain since 8 days in a contact lens wearer Swimming in a pool, contrasting with Moderate epithelial lesions

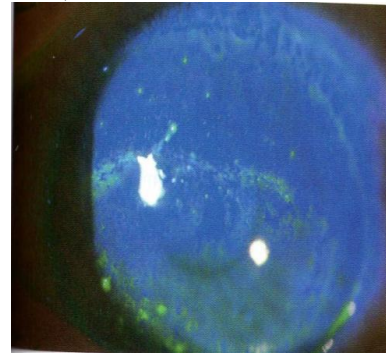


Fig13: Epithelial alterations with the presence of diffuse superficial epithelial lines

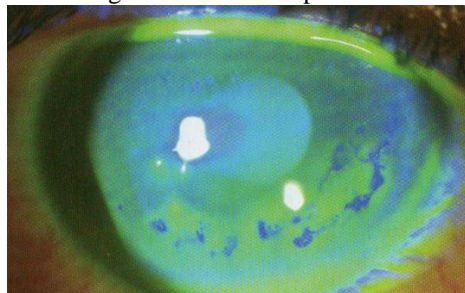


Fig14: Diffuse involvement of the lower cornea with a "pseudo dendritic" appearance. There is no diffusion of the dye under the edges of the epithelial anomalies

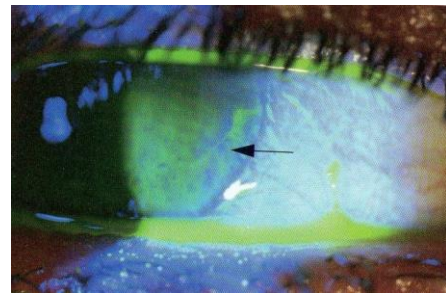


Fig15: Typical epithelial line of early amoebic keratitis

Deep forms of amoebic keratitis [1] are seen late, manifesting as an annular infiltrate with epithelial defect, a central corneal ulcer (Fig16) or deep corneal abscess with risk of perforation (Fig17). This serious infection can evolve into hypopyon, corneal vascularization and leave after-effects such as corneal opacities that impact visual function.

Any dendrite under the lens is an amoeba until proven otherwise.

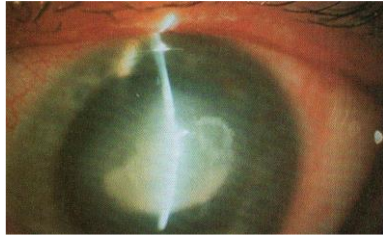


Fig16: Amebic keratitis with dense corneal infiltration and overlying ulcer

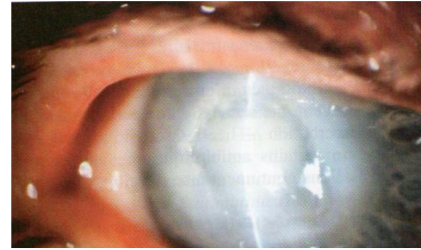


Fig17: Very advanced amoebic keratitis with a 50% decrease in central corneal thickness. The prognosis is poor.

The treatment of amoebic keratitis is based on anti-amoebic drugs in the form of eye drops after debridement of the epithelial lesions, but their effectiveness depends on the earliness of the diagnostic.

4. Complications and emergencies

Infectious keratitis represents 3 to 10% (Dart 1993b) of ophthalmological emergencies, SPK (superficial punctate keratitis) is found in 66% of cases, corneal ulceration in 17% of cases (Duran De La Collina 1998b) [1] and serious complications in 5% of cases (Radford 1998b) [1].

5. Treatment and prevention

Treatment depends on the condition of the cornea and the presence of serious factors (Table I). Prior to any treatment, removal of a corneal abscess is the first step in treatment because it reduces the local infectious load. In addition, identification of the germ is essential to guide therapy. Infectious keratitis requires an etiological treatment (antibiotic, antifungal or anti-amoebic). In the most serious cases, hospitalization is necessary [3]. The goal is to avoid corneal scars that affect transparency and condition the functional prognosis of the eye.

The prevention of infectious keratitis due to contact lens wear is based on the use of saline rinsing solutions in single doses, frequent and rigorous disinfection of the lenses, the use of bactericidal, fungicidal and amoebicidal cleaning products, and finally, informing lens wearers of the risks involved and the precautions to take [3].

Severity Criteria
corneal abscess > 2mm
located within 3 mm of the optical axis
Tyndall
Hypopion
Threat of perforation
Scleritis
Associated endophthalmitis
Monophthalmic patient
Immunodeficiency
Problems with treatment compliance and/or hygiene

Table I: Severity Criteria

6. Conclusion

Infectious keratitis related to contact lens wear is serious; they can permanently affect the visual prognosis. Prevention requires adaptation under medical supervision, education of patients at potential risk of infection, and compliance with trade regulations.

7. Acknowledgement

No acknowledgment.

8. Conflict of interest statement

We certify that there is no conflict of interest with any financial organization in the subject matter or materials discussed in this manuscript.

9. Authors' biography

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* Passed the competition to access the grade of lecturer A in ophthalmology in 2019.

* Passed the competition to access the rank of university hospital professor in 2023.

10. References

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