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Contact lenses and dry eye syndrome: can they be reconciled?

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HIGHLIGHTS

Proper fitting of contact lenses, selecting the right material, and caring for the eye surface can enable comfortable use of contact lenses.

ABSTRACT

The function of the tear film is to moisturize, lubricate, nourish, and protect the delicate surfaces of the cornea and conjunctival epithelium covering the eyeball and eyelids. A healthy tear film is crucial for shaping and maintaining a smooth refractive surface of the cornea, ensuring proper optical function of the eye by eliminating small irregularities in the epithelium. Contact lens wearers often experience various discomforts related to wearing lenses, known as contact lens discomfort (CLD), which can lead to discontinuation of lens wear. CLD is frequently associated with dry eye disease, caused by tear film disorders resulting from incorrect composition, reduced production, or excessive evaporation of tears from the ocular surface. Contact lens wear can diminish corneal sensitivity and lead to a reflex blockade of sensation, causing a deficiency in the aqueous layer of the tear film. Additionally, wearing contact lenses may increase tear evaporation due to reduced blinking frequency and incomplete eyelid closure during blinking. This paper discusses therapeutic approaches and modifications in lens fitting aimed at maintaining a healthy ocular surface and improving comfort for contact lens wearers.

Key words: dry eye disease, contact lenses, contact lens discomfort

INTRODUCTION

The tear film performs several important functions. It moisturizes, lubricates, nourishes and protects the delicate surface of the cornea and the conjunctival epithelium covering the surface of the eyeball and eyelids. A proper tear film helps shape and maintain a smooth refractive surface of the cornea by reducing the fine irregularities of the epithelium, which allows for proper optical function of the eye. The task of the tear film is also to inhibit the growth of micro-organisms through flushing and antimicrobial action, mainly due to its lysozyme content [1].

Dry eye disease (DED) represents a heterogeneous group of conditions with tear film insufficiency and signs and/or symptoms of ocular surface inflammation and damage [2]. DED is not a single condition, but rather a complex, multifactorial and multisymptomatic syndrome of ocular disorders. The cause of DED is a disorder of the tear film, which is associated with its abnormal composition, reduced production or excessive evaporation of tears from the ocular surface [3].

We can also divide the causes of tear film disorders into modifiable ones (e.g. smoking, taking dehydrating supplements) and non-modifiable ones (age, gender). All of these factors lead to abnormalities in the tear film, characterized by an increase in osmolarity and cytokines, which consequently leads to inflammation [2, 3].

The problem of dry eyes is a serious, difficult and age-old one because attempts to treat DED date back to the time of Hippocrates (circa 450 BC), who was one of the first to introduce eye moisturizing "preparations". These were a mixture of bird's egg whites, animal fats and various herbal extracts [4]. The estimated worldwide prevalence of DED ranges from 5% to 50% and varies by population [3]. Dry eye is clinically subdivided into two subtypes: one with decreased tear secretion (aqueous-deficient DED), and one with increased tear evaporation (hyperevaporative DED). It is estimated that up to 80% of patients with DED suffer from excessive tear evaporation, either alone or in combination with a deficiency in the tear film's aqueous layer. Only about 20% of patients develop the pure form associated with aqueous film deficiency [2, 3].

Contact lens wear may result in decreased corneal sensitivity, with reflex sensory block leading to aqueous deficiency [5]. At the same time, contact lens wear may also result in increased evaporation due to a reduced blink rate and/or incomplete lid closure during blinking. In addition, poor lens wettability may also contribute to increased evaporation [6]. Subjective and objective symptoms of DED include foreign body and burning sensation, tearing, eye discomfort, redness, hypersensitivity to light and/or temperature [2].

It is well known that an adequate and stable tear film is necessary for the proper use of contact lenses. Therefore, DED is often considered an absolute contraindication to the application of contact lenses. The ophthalmologic examination of the contact lens user, both at the initial visit and at each follow-up visit, should include a detailed analysis of the tear film using also staining of the conjunctiva and cornea [7].

Contact lens wearers complain of various types of contact lens discomfort (CLD), which can result in discontinuation of lens wear and is often associated with DED. The contact lens divides the tear film into two layers: the tear film in front of and behind the lens. This change leads to instability of the tear film in front of the lens, decreased thickness of the tear film in front of and behind the lens, and increased friction between the contact lens and the surface of the eye [8].

Objective symptoms of DED associated with contact lens use include areas of drying of the soft lens surface (fig. 1), lens deposits (fig. 2, 3), conjunctival redness, papillary response of the palpebral conjunctiva, corneal staining, arched

FIGURE 1

Drying areas of the soft contact lens.

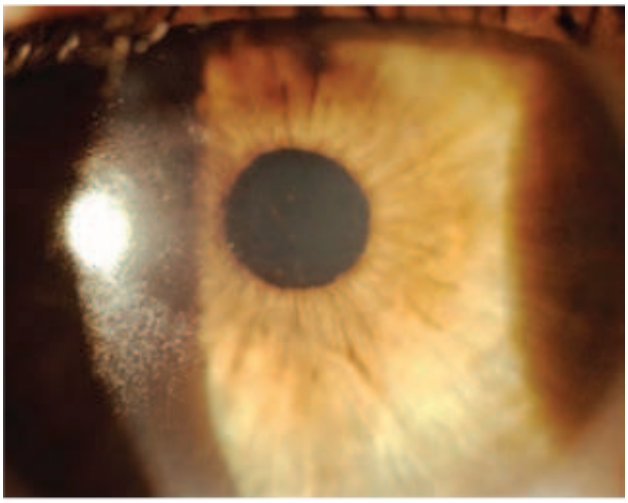


FIGURE 2

Deposits on the surface of the soft contact lens.

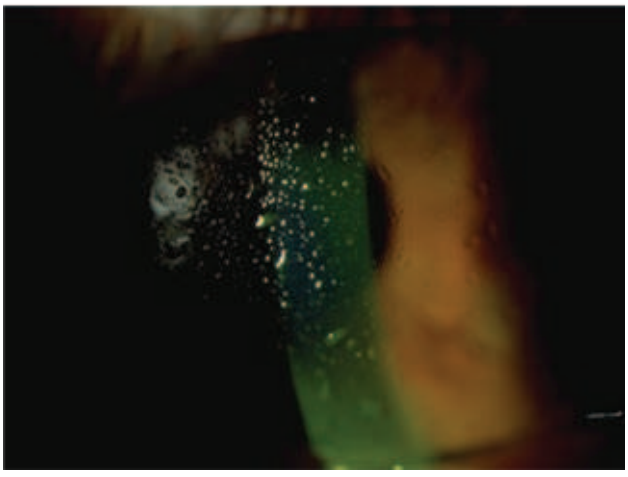
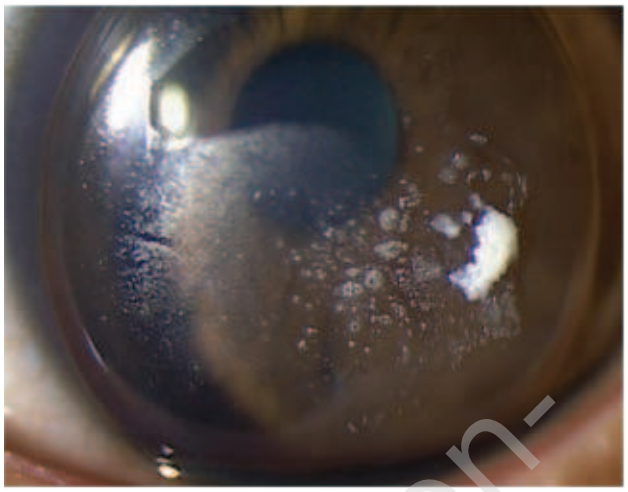


FIGURE 3

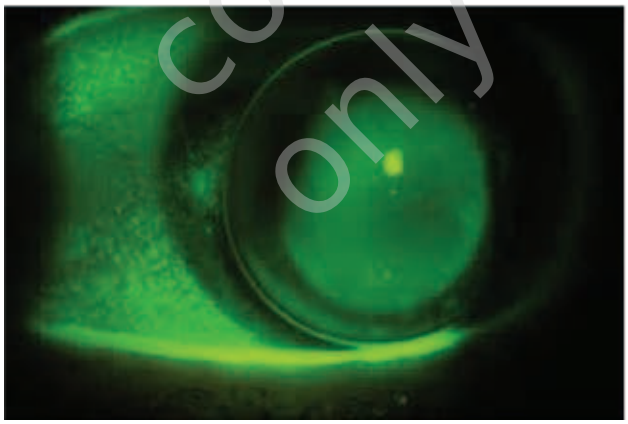
Deposits on the surface of the contact rigid gas permeable lens.



epithelial damage in the upper part of the cornea, 3–9 clock hours corneal staining in users of rigid gas permeable (RGP) lenses (fig. 4), staining of the lower 1/3 of the cornea in soft contact lens users, and wiper epitheliopathy of the upper eyelid margin (fig. 5) [7, 9].

FIGURE 4

Corneal staining with fluorescein for 3–9 clock hours near the stroma in rigid gas lens preamble users.



PROCEDURE WITH THE PATIENT DURING THE QUALIFICATION VISIT FOR CONTACT LENS APPLICATION

There is a close relationship between contact lenses and precorneal tear film (PCTF), so factors that affect one will affect the other. Therefore, factors identified in the interview, such as systemic diseases and the associated use of drugs that often cause reduced tear production, e.g. antihistamines, tricyclic antidepressants, β-blockers, oral contraceptives and non-steroidal anti-inflammatory drugs, should be modified if possible. Any pre-existing conditions, such as blepharitis or meibomian gland dysfunction, should be treated before lens application. Another important factor is learning and awareness of full and frequent blinking [2].

FIGURE 5

Lysine green staining showing wiper epitheliopathy of the upper eyelid margin.

The patient should be informed about the importance of lifestyle modifications for the comfort of using contact lenses, which include:

- avoiding situations known to increase tear film evaporation (e.g. smoking, strong wind, air conditioning)
- maintaining good hygiene when working with a computer – placing the computer monitor 10–20 degrees below eye level so as to reduce the size of the palpebral fissure and reduce evaporation of the tear film
- using an air humidifier at home and/or workplace
- increased water consumption and reduced alcohol consumption [7].

TREATMENT OF A PATIENT COMPLAINING OF DISCOMFORT WHEN WEARING CONTACT LENSES

The simplest procedure to improve the comfort and safety of using contact lenses is to change the lens wearing regime to 1-day use and limit the time of wearing them. In terms of the characteristics of the contact lens itself, it is possible to change the lens material, if ionic – to non-ionic, i.e. increasing the wettability of the material by adding n-vinylpyrrolidone instead of methacrylic acid or vice versa. It is worth trying to change the water content – if it is high – to low or vice versa. The comfort of use can also be improved by choosing a thicker lens, but safely enough not to impair oxygen transmission. It is known that the smaller the central thickness, the greater the dehydration and drying of the cornea, and therefore the less mobility of the lens and the worse the exchange of the tear film from under the lens. Thicker lenses are more mobile than thin ones. The

mobility of the contact lens allows removal and dispersion of contamination from the ocular surface, facilitates tear film replacement, and probably promotes hydration of the corneal epithelium by spreading and smoothing the mucin layer of the tear film [2, 3, 7].

TREATMENT OF DED

Inflammation is a key mechanism in many cases of DED. Appropriate treatment depends on distinguishing between forms of DED in which inflammation is the primary cause and those in which inflammation plays a less significant role. Most often, all patients with DED are treated with anti-inflammatory drugs at a certain stage of the disease. Corticosteroids are one of the most effective and fastest treatments available for suppressing inflammation on the ocular surface. It is recommended to use topical steroid preparations without preservatives for a short period of time in pulse therapy. Another pillar of anti-inflammatory therapy is cyclosporine A and omega-3 fatty acids. It is also worth changing the patient's contact lens care system to a solution without preservatives, which prevents preservatives from binding to deposits that contribute to dryness and inflammation [2–4].

Each patient should receive supplements to the tear film, such as preservative-free moisturizing drops and, in advanced cases, slow down the evaporation of the tear film by occluding tear points with plugs and learning to blink. The action of moisturizing drops is multidirectional and also includes diluting and rinsing out pro-inflammatory substances [2, 4].

In some countries, for severe DES, including Sjögren's syndrome, innovative forms of topical drugs that increase water and mucin secretion are also available, such as diquafosol sodium and rebamipide [10].

In the case of DED causing meibomian gland dysfunction, antibiotic therapy is used. The two main groups of antibiotics are tetracyclines and macrolides. Relatively new methods recommended for the treatment of MGD are intensive pulsed light therapy and thermal pulsation [3].

Contact lenses in the treatment of DED

In some cases of ocular surface infection (especially graft-versus-host disease, bullous keratopathy, or following chemical corneal burn), soft contact lenses may provide comfort by reducing photophobia and corneal pain [11]. For patients with severe DED in case of failure of conventional treatment, scleral lenses are the best lens option. Scleral and miniscleral lenses provide constant hydration of the cornea and conjunctiva by maintaining direct contact of the tear film under the lens material. They have a protective effect and protect against abrasions and mechanical injuries that often occur due to irregular eyelid scars and misdirected eyelashes. Studies using scleral lenses confirm improved comfort, reduced dry eye symptoms and improved visual acuity with a good safety profile in patients with severe ocular surface diseases [9, 12].

SUMMARY

This work focuses on the issues related to the discomfort of wearing contact lenses and their impact on the eye surface. Through proper modifications in the selection of contact lenses and the application of appropriate therapeutic methods, it is possible to minimize these ailments and achieve comfort in wearing contact lenses. By ensuring a proper tear layer and maintaining a healthy eye surface, patients can enjoy the comfort of wearing contact lenses, which is crucial for their acceptance and long-term use.

Figures: author's own resources.

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