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The most common etiological factors of conjunctivitis

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Abstract

Conjunctivitis is one of the most common diseases of the anterior segment. It is characterized by redness of the eye, conjunctival injection, the presence of secretions in the conjunctival sac. The most common symptoms reported by patients include: pain, redness, itching, foreign body sensation and photophobia. Intensifying severe symptoms can lead to difficulties in daily activities. The correct diagnosis of the etiological agent is essential to implement an appropriate treatment and relieve symptoms of the disease.

Key words: conjunctivitis, eye, microbiology.

Introduction

The conjunctiva is a transparent mucous membrane that lines the inner eyelids and surface of the eyeball, reaching up to the corneal limbus. It is characterized by a rich network of lymphatic vessels and the presence of immune cells. It prevents the development of the eye infection (1). When it comes to infection, there are a number of specific and non-specific symptoms. Their analysis may facilitate proper classification of diseases and identification of the etiological agent. Non-specific symptoms of conjunctivitis include: tearing, pain, burning, itching, foreign body sensation in eyes and photophobia. The type of discharge in the conjunctival sac is important in diagnostic process. Watery discharge occurs in the course of acute viral or allergic conjunctivitis. Purulent discharge suggests bacterial etiology. The mucous secretion is typical for allergic conjunctivitis, and the muco-purulent discharge for bacterial infections or rarely encountered, chlamydial infections. Besides the interpretation of the type of secretion, the follicular and papillary reactions are crucial in determining the etiology of infection. The follicular changes on the surface of conjunctiva are observed in the case of viral inflammation and chlamydial. On the other hand, papillary changes occur most frequently during bacterial infections, and sometimes allergies.

Bacterial etiology

The microorganisms present in the conjunctival sac and on the edges of the eyelids compose the physiological flora. We can differentiate permanent and transient flora. The permanent flora is dominated by Gram-positive bacteria, particularly *Staphylococcus epidermidis* and *Corynebacterium xerosis* (2). Whereas the transient flora composes from:

- Gram-positive bacteria: *Staphylococcus aureus*, *Streptococcus*, *Corynebacterium*, *Bacillus*
- Gram-negative bacteria: *Pseudomonas aeruginosa*, *Haemophilus*, *Moraxella*, *Neisseria*, *Klebsiella pneumoniae*, *Proteus* (3), enterobacteria (*Escherichia coli*, *Enterobacter*)
- Fungi e.g. *Candida*, *Aspergillus*.

Because of the presence of the eyelids, eyelashes, tear film, the blink reflex and the mechanisms of the immune system, microflora is not a source of infection. After breaking the natural barrier, microorganisms can colonize the vicinity of the eye, multiply and lead to infection. Recent studies show that bacterial conjunctivitis in adults is commonly caused by *Staphylococcus aureus*, coagulase-negative staphylococci, *Streptococcus pneumoniae* and *Pseudomonas aeruginosa* (4). Single cases of conjunctivitis are caused by *Corynebacterium diphtheriae*. They are fairly easy to identify because of the presence of pseudo membranes that infiltrate superficial layers of the conjunctiva's epithelium. In newborns, the most common etiological

factor is *Staphylococcus aureus*. Less common conjunctivitis in newborn children is caused by *Neisseria gonorrhoea*. In infants, older children and the elderly people, the most common causes of bacterial conjunctivitis are *Haemophilus influenzae*, *Streptococcus pneumoniae* and *Moraxella catarrhalis* (5). The most frequently used antibiotic in bacterial conjunctivitis are ofloxacin, tobramycin and neomycin. The antibiotic therapy is often supported by topical corticosteroids.

Despite the high frequency of bacterial conjunctivitis, it is worth considering whether the inclusion of antibiotics is necessary. According to the literature, only 5% of patients with symptoms of bacterial conjunctivitis treated without using antibiotics will visit the physician again in one month (6).

Viral etiology

Viral inflammations account for 80% of all conjunctivitis. They are very infectious and require a rigorous sanitary regime as a prevention of spreading infection. Hand hygiene and the use of separate hygiene devices are often insufficient. Sometimes it is necessary to isolate the patient. The most epidemic are conjunctivitis caused by Adenoviruses. In recent years, there has been a change in the frequency of infections caused by respective adenovirus serotypes (7), but this is not important for clinical practice. Enteroviruses and Coxsackie viruses cause hemorrhagic conjunctivitis (8). The onset of the disease is very rapid. Hemorrhages are characteristic symptom. If the infection is limited only to the conjunctiva, despite the turbulent dynamic of the disease process, the prognosis is good. *Herpes virus* may cause follicular conjunctivitis, especially in primary infection. The other classic symptom is the occurrence of unilateral skin lesions- watery blisters. Herpes infection is as extremely contagious as the infection triggered by adenoviruses (9). A dangerous complication of herpetic conjunctivitis is keratitis. The treatment of this disease is difficult and the prognosis is often unsuccessful. This complication is frequently terminated by a corneal transplantation with a high risk of recoil and the need for re-transplantation. Until recently, conjunctivitis caused by picornaviruses has been rare in Europe. They dominated in African countries and in East Asia. Globalization, tourism development, the increase in the geographic population shift between countries and continents in recent years have contributed to the higher morbidity rate due to viral conjunctivitis (10). Although the treatment is usually limited to the isolation of the patient and the adherence to the sanitary regimen, it is necessary to apply pharmacotherapy if we are dealing with *Herpes virus* infection. Ganciclovir is used for topical treatment, whereas Acyclovir is applied for systemic use.

Allergic etiology

The allergic conjunctivitis occurs quite often. It is believed that currently 15% of the world's population is struggling with the allergy problem (11). The percentage of people suffering from allergies is still growing. Allergic conjunctivitis is not difficult to diagnose if the symptoms are seasonal or severe. Conjunctivas are red and swollen (sometimes the swelling is so large that the patient cannot open the eyelid). Moreover, the conjunctival sac is filled with a large amount of watery secretion. These symptoms are usually accompanied by watery runny nose, sneezing, itching in the nose and in the ears. Mast cell mediators (12) play an important role in the pathomechanism of the disease. The most common allergens are: wind-pollinated plants' pollen, mites, fungi (especially molds), animal fur and toxic fumes. In prevention, the most important is avoiding the allergen exposure. Conjunctivitis can be treated pharmacologically, using topical medicaments (e.g. eye drops with Ectoine) or systemic: antihistamines (e.g. Loratadine), nonsteroidal anti-inflammatory agents and mast-cell stabilizers. In extreme cases of acute and chronic conjunctivitis, corticosteroids and immunomodulators agents (13) can be used in therapy. The non-pharmacological process plays also a significant role, i.e. eye irrigation with saline, using the artificial tears without preservatives and applying cold compresses on eyelids.

Chlamydial etiology

There are two types of chlamydial conjunctivitis: inclusion inflammation and trachoma (*Chlamydia trachomatis* serotypes A, B, Ba and C). The trachoma is virtually unheard of in Europe, but it is an endemic disease in Africa, Asia, Latin America, the Middle East and Australia. In these regions, microorganisms can be transmitted by a domestic fly.

Chlamydial conjunctivitis is usually caused by *Chlamydia trachomatis* and *Chlamydia pneumoniae*. They mainly concern newborns (also born by caesarean section). The infection comes from the mother's genital tract. In the case of *Chlamydia trachomatis* diagnosis is most often made in the first week of life (14). The complication of conjunctivitis caused by *Chlamydia pneumoniae* is an obstruction of lacrimal ducts, which affects 50% of ill newborns (15). In adults, the infection is generally venereal and occurs sexually active people. Ophthalmic changes appear about a week after sexual contagion. It may be accompanied by nonspecific inflammation of the urethra and cervix. Due to the high frequency of general co-infection, the treatment consists of systemic antibiotic therapy (Azithromycin, Erythromycin, Doxycycline, Tetracycline) assisted with local treatment (Azithromycin, Moxifloxacin). In the cases of advanced trachoma, surgical treatment is necessary

Summary

The diagnosis of conjunctivitis is based on the interview and eye examination in the slit lamp. Typical objective signs, such as: hyperemia ("red eye"), the presence of characteristic discharge, mucosal swelling and subjective symptoms: burning, itching and triad of symptoms (tearing, photophobia, narrowing of the eyelid) make it possible to initially qualify the inflammation for a particular type of conjunctivitis. However, the basic examination is sometimes insufficient. In cases of recurrent inflammatory conditions, diagnostically difficult or in patients not responding to treatment, bacteriological tests are indicated. They allow to implement elective treatment against a specific pathogen. However, we should remember that the results of microbiological tests after applying antibiotic therapy may be falsely negative. Therefore, in most cases, the diagnosis is based primarily on the physician's experience.

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