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The management of bacterial conjunctivitis

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ABSTRACT

Introduction and Purpose: Bacterial conjunctivitis, a common eye disease characterized by inflammation of the conjunctiva, poses a major challenge in clinical practice due to its prevalence, diverse etiology and the need for effective pharmacological treatment. The conjunctiva is constantly exposed to the adverse effects of various external and internal factors. This review is devoted to the pharmacological treatment of bacterial conjunctivitis, with a focus on the most common causative agents.

Materials and Methods: A comprehensive survey of articles published in scientific journals was conducted via PubMed and Google Scholar online research platforms. Articles were searched by entering keywords in the appropriate configuration: “bacterial conjunctivitis,” ‘pharmacotherapy,’ ‘bacterial,’ and ”antibiotics.”

Description of current knowledge: Emerging research has shown that the choice of antibiotic for the treatment of bacterial conjunctivitis depends primarily on the etiology and severity of the infection.

Summary: Antibiotic therapy is an effective tool in the treatment of bacterial conjunctivitis, but its use requires consideration of etiology, severity of infection and potential risk of resistance. Collaboration between ophthalmologists and microbiologists is necessary for the optimal management of this condition. Acute bacterial conjunctivitis is a prevalent eye condition that requires prompt and appropriate pharmacological management.

Keywords: “bacterial conjunctivitis”, “pharmacotherapy”, “bacterial”, “antibiotics”

Introduction:

Empirical topical treatment with a broad-spectrum antibiotic such as a fluoroquinolone is sufficient in most cases. Erythromycin ointment, and third-generation topical cephalosporins may also be effective [1][2]. Severe or atypical infections: Require detailed diagnosis (culture) and treatment adjustment based on the susceptibility of the microorganism. Specific infections (Chlamydia, Neisseria): It is necessary to include systemic antibiotics and cooperate with a specialist. Concurrent consideration of the problem of antibiotic resistance and promotion of ocular hygiene remain key to the prevention and successful treatment of bacterial conjunctivitis. Bacterial infections are among the important causes of conjunctivitis. Under normal conditions, there is a bacterial flora on the surface of the eye and its appendages that protects the eyeball from pathogenic microorganisms. The conjunctiva is constantly subjected to the adverse effects of various external and internal factors. Various factors, such as poor hygiene, lowered immunity and exposure to external agents, can disrupt this delicate balance, leading to acute bacterial conjunctivitis [3].

Examples of microorganisms that cause bacterial conjunctivitis and treatment management

The most common bacterial causes of conjunctivitis include *Staphylococcus aureus*, *Streptococcus pneumoniae*, *Neisseria* spp [4] [2], *Staphylococcus epidermidis*, *Haemophilus influenzae*, *Haemophilus duplex* and *Moraxella lacunata*. The diagnosis is primarily based on clinical assessment, with patients typically presenting with signs and symptoms such as redness, discharge, and a sensation of a foreign object in the eye [5] [2] [3]. Sometimes general symptoms are also observed: enlargement of lymph nodes in front of the auricle, pharyngitis, otitis, or runny nose and cough in the course of allergies or respiratory infections.

Table 1: Examples of Topical Antibiotics Used in Bacterial Conjunctivitis

Group of antibiotics	Antibiotic
Aminoglycosides	Amikacin
Aminoglycosides	Gentamicin
Aminoglycosides	Neomycin
Aminoglycosides	Tobramycin
Macrolides	Erythromycin
Azalides	Azithromycin
Fluoroquinolones	Ciprofloxacin
Fluoroquinolones	Ofloxacin
Fluoroquinolones	Levofloxacin
Fluoroquinolones	Moxifloxacin

Patients with bacterial conjunctivitis exhibit a wide range of clinical manifestations. The cardinal symptoms include eye discomfort, superficial redness, purulent or mucopurulent discharge in the conjunctival sac, eyelash and eyelid sticking, and swelling of the conjunctiva and eyelids. Conjunctival inflammation frequently affects both eyes, often with a delay in one eye. The severity can range from mild congestion to extensive purulent discharge. The condition tends to resolve spontaneously, and if left untreated, it typically regresses within 10-14 days [6]. Implementing appropriate treatment, which involves selecting the suitable antibiotic for the bacterial cause, is advisable due to the possibility of the infection advancing to a chronic state or the tendency for the disease to spread to other eye structures, such as the cornea. [7][3][2]. Most often, a broad-spectrum drug, such as drops from the fluoroquinolone group (norfloxacin, ofloxacin), is used empirically during the day, administered 4 times a day. The drugs are used until secretions stop collecting in the conjunctival sac (about 5-7 days) [8] [9]. Gonococcal conjunctivitis is one of the most severe inflammatory conditions affecting the conjunctiva, which primarily occurs in adults. Very profuse purulent discharge with swelling

and soreness of the eyelids and significant enlargement of the parotid lymph nodes can suggest dangerous gonorrhoea inflammation, which, if untreated, can cause serious complications. Enlargement of the parotid lymph nodes can also be a symptom of a viral infection, or an infection caused by chlamydia [10]. The symptoms manifest relatively abruptly, developing within 12-24 hours. Gonorrhoea is a genitourinary infection caused by Gram-negative bacteria, and the ocular form of this disease is the result of the physical transfer of secretions containing the bacterial pathogens into the eye. Symptoms of gonorrhoeic conjunctivitis are treated with single-dose antibiotic therapy by intravenous injection, such as cefoxitin 1 g, cefotaxime 500 mg, ceftriaxone 1 g by intramuscular injection, or ciprofloxacin 500 mg or ofloxacin 400 mg orally. Topically, gentamicin or ciprofloxacin is administered by drops every 2 hours. Before administering the drug into the conjunctival sac, it is advisable to rinse it with saline (0.9% Sol. Natrii Chlorati). Chlamydial conjunctivitis often coexists with gonorrhoea. Therefore, the patient usually takes concomitant oral azithromycin in a single dose of 1 g or doxycycline 100 mg tablets every 12 hours for 7 days [11] [8] [9].

Chlamydia trachomatis can cause ocular diseases, including inclusion conjunctivitis and trachoma. Adult inclusion conjunctivitis, formerly known as "pool" conjunctivitis, is typically a sexually transmitted infection caused by Chlamydia trachomatis serotypes D-K. The symptoms, characterized by a mucopurulent discharge in one eye, typically develop within seven days of infection. If left untreated, Chlamydial conjunctivitis can lead to recurrent and chronic complications. To confirm Chlamydia trachomatis infection, serologic and cytologic tests (e.g., Giemsa stained cytology) are performed. For general treatment, antibiotics are administered orally: doxycycline in one of the therapeutic regimens (300 mg/week for 3 weeks or 100 mg/day for 1-2 weeks), tetracycline or erythromycin for 6 weeks, and azithromycin in a single dose. Topical application of ointment containing erythromycin, tetracycline or sulfonamide 2-3 times a day for 2 to 6 weeks [8][12][13] [9].

Trachoma, caused by serotypes A, B, Ba, and C of Chlamydia trachomatis, primarily affects individuals residing in areas with poor sanitation, particularly in Asia, Africa, and the Mediterranean region. Personal hygiene, including regular face washing in children, plays a crucial role in prevention. The disease is characterized by the development of papules in the conjunctiva and eyelids, accompanied by infiltrates and papillae, leading to an inflammatory process. In the later stages, this can result in scarring of the conjunctiva, which may cause abnormal eyelash growth and corneal complications. If left untreated, trachoma can potentially progress to blindness in severe cases [9]. Treatment of the active form of icterus involves oral

administration of single-dose azithromycin (20 mg/kg), doxycycline, erythromycin or tetracycline for 2 weeks. For topical treatment, an ointment containing erythromycin, tetracycline or a sulfonamide is applied to the conjunctival sac 2-4 times a day for 3-4 weeks [8][14].

Conjunctivitis in neonates can occur within the first month of life. Chlamydia or gonorrhea infections can be transmitted from the mother's genital tract during childbirth. Chlamydial conjunctivitis typically manifests between the 5th and 14th day after birth, presenting as acute conjunctivitis with mucopurulent discharge. The management involves topical tetracycline and systemic erythromycin at a dose of 25 mg/kg every 12 hours for 14 days. Gonococcal conjunctivitis, a less common eye infection in newborns, develops within 1-3 days after birth. The risk of gonococcal conjunctivitis in the infant of a sick mother is 30-47%, and this also applies to babies born by cesarean section. The consequences of gonorrheal conjunctivitis are very serious and can lead to blindness. Currently, in many countries, universal testing of pregnant women for gonorrhea is not performed. Even if they were performed, current methods do not provide 100% assurance that the mother is healthy. Treatment options include topical and systemic benzylpenicillin at a dose of 50,000 IU/kg given every 12 hours for 7 days or intramuscular cefotaxime at a dose of 100 mg/kg. Prophylaxis of gonorrheal conjunctivitis in newborns is performed by Crede's procedure. Currently, a 1% silver nitrate solution is used, which should be sprinkled into the lower fold of the conjunctival sac within 2 hours after birth. When performed correctly, the Crede procedure does not cause serious side effects. Its sequelae may be chemical conjunctivitis in the form of irritation of the conjunctiva, which resolves spontaneously in about 1-2 days with standard care of the child's eyes [15][16]. Bacterial conjunctival infections in newborns can also be caused by *Staphylococcus aureus* and can occur at any stage of life [9].

Practical steps: Conjunctivitis is a condition that can frequently be managed effectively by primary care practitioners, particularly in cases of purulent, bacterial inflammation. However, certain symptoms necessitate prompt referral to an ophthalmologist. These include visual impairment, ocular discomfort, ipsilateral headache, heightened light sensitivity, pupillary abnormalities, and corneal opacification. It is crucial that patients' family members and close contacts undergo examination and receive treatment if infected. General practitioners should pay special attention to patients exhibiting inflammation without purulent discharge, unilateral inflammation, and those wearing contact lenses or reporting a history of eye trauma [17]. In

most cases, bacterial conjunctivitis is self-limiting and does not necessitate active treatment, requiring only close monitoring [18][19][17]. Antibiotic drops for administration in bacterial conjunctivitis are not necessary in some cases, but they shorten the duration of symptoms and reduce the risk of transmission [20]. The use of combination treatment with an antibiotic and a glucocorticosteroid may be employed in certain cases. However, it should be noted that eye drops containing glucocorticosteroids should only be prescribed by an ophthalmologist following a comprehensive examination of the patient's eyes. Prior to administering the drops, it is advisable to gently remove any lingering secretions from the conjunctival sac and clean the eyelids. Thorough hand washing is necessary both before and after applying the medication. Patients who wear contact lenses must discontinue their use for the duration of the treatment. Emphasizing proper hygiene and isolation measures is crucial to prevent the spread of the infection to close contacts.

The importance of prevention: The prevention of bacterial conjunctivitis centers on several fundamental principles aimed at mitigating the risk of infection and its transmission.

Personal hygiene:

Maintaining proper hand hygiene by washing with soap and water, particularly after interacting with the face, eyes, or potentially contaminated areas, is crucial. Additionally, refraining from touching the eyes with hands, especially in public settings, and regularly changing towels and bedding, especially during an ongoing infection, are essential preventive measures.

Proper use of contact lenses

Adhering to proper hygienic practices when inserting and removing contact lenses, including regularly cleaning and disinfecting the lenses with suitable solutions. Additionally, refraining from wearing contact lenses in swimming pools and during episodes of eye infections.

Avoiding contact with infected people

Bacterial conjunctivitis is a communicable condition, so limiting exposure to infected individuals and adhering to proper hygiene practices are crucial preventive measures [21].

Eye protection in areas of exposure

Employing protective eyewear in settings with potential exposure to contaminants such

as dust, chemicals, or other irritants can assist in preventing the development of conjunctivitis.

Health education

Educating the public about proper eye hygiene and infection control strategies is essential for mitigating the occurrence of bacterial conjunctivitis.

Summary: Bacterial conjunctivitis is a common eye infection caused by various bacteria, leading to inflammation of the conjunctiva. It is typically diagnosed based on clinical symptoms such as redness, discharge, and discomfort in the eye. The most common causative organisms include *Staphylococcus aureus*, *Streptococcus pneumoniae*, *Neisseria spp.*, and *Haemophilus influenzae*. In most cases, the infection resolves spontaneously within 10-14 days, but treatment with antibiotics is often recommended to prevent complications. Empirical treatment involves the use of broad-spectrum topical antibiotics like fluoroquinolones (e.g., levofloxacin, moxifloxacin) or aminoglycosides (e.g., gentamicin). Severe or recurrent infections may require a culture to determine the causative bacteria and adjust the therapy accordingly. Specific infections, such as gonococcal or chlamydial conjunctivitis, require systemic antibiotics (e.g., ceftriaxone, azithromycin) along with topical treatments.

Prevention focuses on maintaining good hygiene, avoiding contact with infected individuals, and proper use of contact lenses. Promoting patient education and adherence to treatment is essential for reducing recurrence and minimizing transmission. Antibiotic resistance remains a concern, emphasizing the need for careful management and avoidance of unnecessary antibiotic use. Collaboration between healthcare professionals is key to optimal management and patient outcomes

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Statement of the authors' contribution

Grzegorz Szcześniak: Conceptualization, Writing-rough preparation

Aleksandra Kielczewska: Methodology, Investigation Resources

Anna Kielczewska: Formal analysis, Visualisation, Writing-review and editing

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