Acta Scientific Pharmaceutical Sciences (ISSN: 2581-5423)

Volume 2 Issue 11 November 2018

Review Article

Diagnosis and Management of Bacterial Conjunctivitis

Shamweel Ahmad*

Professor of Medical Microbiology and Consultant Microbiologist, Department of Medical Laboratory Sciences, College of Medical Sciences, Prince Sattam Bin AbdulAziz University, Saudi Arabia

***Corresponding Author:** Dr. Shamweel Ahmad, Professor of Medical Microbiology and Consultant Microbiologist, Department of Medical Laboratory Sciences, College of Medical Sciences, Prince Sattam Bin AbdulAziz University, Saudi Arabia.

Received: August 28, 2018; **Published:** October 30, 2018

Abstract

Bacterial conjunctivitis is the second most common cause of infectious conjunctivitis. Majority cases of uncomplicated bacterial meningitis get resolved within 1 to 2 weeks. Almost all cases of bacterial conjunctivitis are self-limiting and do not cause any significant morbidity. Bacterial conjunctivitis is seen among the patients of all age groups. Classical signs and symptoms are a red eye with purulent drainage which lasts for the whole day. High levels of ocular and systemic morbidity are mainly due to *Chlamydia trachomatis* and Neisseria in cases of Chronic and hyper acute forms of bacterial conjunctivitis. It is mandatory to treat Gonococcal and Chlamydial conjunctivitis with systemic antibiotics. Other organisms causing bacterial conjunctivitis can be treated empirically with topical antibiotics. Patients with complicated problems like severe eye pain, reduced vision, contact lens use, a hazy-appearing cornea, and poor response to empirical treatment need to be referred to a consultant ophthalmologist.

Keywords: Diagnosis; Bacterial Conjunctivitis; *Streptococcus pneumoniae; N. gonorrhoeae*

Introduction

Conjunctivitis is defined as an inflammation of the bulbar and/or palpebral conjunctiva. Conjunctivitis, also known as "pink eye," is the most common eye disease, especially in children all over the world. The causative agents of conjunctivitis are different bacteria, fungi, and viruses, as well as toxic and allergic insults.

Gram-positive bacteria such as *Streptococcus pneumoniae, Staphylococcus aureus, Corynebacterium* usually cause milder conjunctivitis as compared to gram negative bacteria.

Milder cases of bacterial conjunctivitis are mostly benign and self-limited and need to be monitored regularly. Such cases usually may not require any treatment or can be treated easily with antibiotics. Bacterial conjunctivitis due gram-negative bacteria such as *Haemophilus influenzae, Pseudomonas aeruginosa, Moraxella, Serratia marcescens, N. gonorrhoeae* and *C. trachomatis* is usually virulent and cause severe infections and ocular perforation within 24-48 hours of infection. Severe bacterial conjunctivitis may lead to blindness and can signify a severe underlying systemic disease.

Bacterial conjunctivitis is common both in children and adults having the symptoms of red eye. In most of the cases it is self -limited, still incorporation of appropriate antimicrobial therapy helps in fast resolution and reduction of complications. It is of utmost importance to distinguish between bacterial conjunctivitis from other types of conjunctivitis and more serious vision-threatening conditions so that the patient is treated appropriately. If a need arises, the patients should be referred to a consultant ophthalmologist as soon as possible.

In this paper diagnosis and management of bacterial conjunctivitis is briefly summarized.

Causes of Conjunctivitis are age dependent

Inflammation or infection of the conjunctiva is known as conjunctivitis and is characterized by dilatation of the conjunctival vessels, resulting in hyperemia and edema of the conjunctiva, typically with associated discharge. It is due to various infectious agents (bacteria, viruses, or fungi) and non-infectious causes (eg, allergic, chemical, and mechanical). Approximately 30% of primary care pa-

tients with infectious conjunctivitis are confirmed to have bacterial conjunctivitis, although 80% are treated with different antibiotics [1]. The bacterial etiology often depends on geography and age, but the most common bacterial pathogens include *Staphylococcus, Streptococcus, Haemophilus, Pseudomonas, Moraxella* species and *Corynebacterium.*

The bacterial pathogens that cause bacterial conjunctivitis tend to differ by patient age (Table 1).

Neonates	*Chlamydia trachomatis* *Staphylococcus aureus* *Haemophilus influenzae* *Streptococcus pneumoniae*
Children	*H. influenzae* *S. pneumoniae* *S. aureus*
Adults	*S. aureus* Coagulase-negative *Staphylococci* *H. influenzae* *S. pneumoni* Moraxella species

Table 1: Bacterial isolates commonly causing conjunctivitis.

In neonates, the predominant causative agents of bacterial conjunctivitis are bacteria, and the most common bacteria is Chlamydia trachomatis. Conjunctivitis due to Chlamydia classically presents with purulent unilateral or bilateral discharge about a week after birth in children born to mothers who have cervical chlamydial infection. Many infants having conjunctivitis due to Chlamydia develop chlamydial pneumonitis: about 50% of infants with chlamydial pneumonitis have concurrent conjunctivitis or a recent history of conjunctivitis [2].

Conjunctivitis among neonates is rarely caused by Neisseria gonorrhoeae. The onset of gonococcal conjunctivitis is somewhat earlier than in chlamydial conjunctivitis, i.e, in the first week of life, and this organism classically causes severe "hyperacute" conjunctivitis with profuse discharge and it may result in corneal involvement and perforation. Administration of routine antibiotic prophylaxis at birth has shown marked reduction in its incidence and complications. Other bacterial pathogens which can cause neonatal conjunctivitis include *Staphylococcus aureus, Haemophilus influenzae*, and *Streptococcus pneumoniae* [3].

In children, bacterial conjunctivitis is usually caused by *H. influenzae* or *S. pneumoniae*, which accounted for about 29% and 20% of cases, respectively, in a prospective study conducted in Israel [4]. Patients immunization against *H. influenzae* was not clear in the study. Conjunctivitis due to *H. influenzae* spreads easily in schools and households. It has been demonstrated that it is associated with concurrent upper respiratory tract infections and otitis media (conjunctivitis-otitis syndrome): 45% to 73% of patients with purulent conjunctivitis also have ipsilateral otitis media [5]. The second commonest organism which causes bacterial conjunctivitis in children is S. pneumonia. It commonly causes epidemic outbreaks among young adults. Newly described unencapsulated pneumococcal strains caused outbreaks that affected 92 recruits at a military training facility and 100 students at Dartmouth University [6]. *S. pneumoniae* is also associated with conjunctivitis- otitis syndrome, accounting for approximately 23% of culture-proven cases.4 Among the bacterial isolates *Moraxella* species, *S. aureus*, and coagulase negative staphylococci are less common causes of bacterial conjunctivitis in children [7-9].

In adults, the commonest causative agents of bacterial conjunctivitis are *H. influenzae* and *S. aureus.* Conjunctivitis caused by *S. aureus* is often recurrent and associated with chronic blepharoconjunctivitis (inflammation of the eyelid and conjunctiva). The conjunctivae are colonized by *S. aureus* in 3.8% to 6.3% of healthy adults [10-12]. In addition, about 20% of people normally harbor *S. aureus* continually in the nasal passages, and another 60% harbor it intermittently; in both cases, the bacteria may be a reservoir for recurrent ocular infection [13]. Other organisms that commonly cause conjunctivitis in adults are *S. pneumoniae*, coagulase-negative staphylococci, and *Moraxella* and Acinetobacter species [14].

Hospital-acquired conjunctivitis

In the literature not much has been published regarding hospital acquired conjunctivitis. A study has shown that in a neonatal intensive care unit (NICU), the most common organisms isolated in patients with conjunctivitis were coagulase-negative staphylococci, *S. aureus*, and *Klebsiell*a species [15]. It has been shown that in patients who were found to have conjunctivitis caused by *Staphylococcus* species, the rate of methicillin resistance was higher in those hospitalized for more than 2 days than those with *Staphy-*

lococcus species who were hospitalized for less than 2 days. This clearly shows that the bacterial pathogens isolated form hospitalized children with conjunctivitis differ from those isolated in the outpatient setting [16].

Clinical features of bacterial conjunctivitis

Often called "pink eye," conjunctivitis is a common eye disease, especially in children. It may affect one or both eyes. Some forms of conjunctivitis are highly contagious and can easily spread in schools and at home. While conjunctivitis is usually a minor eye infection, sometimes it can develop into a more serious problem.

Patients usually complain of a gritty feeling in one or both eyes, itching or burning sensation in one or both eyes, excessive tearing, discharge from one or both eyes, swollen eyelids, pink discoloration to the whites of one or both eyes, increased sensitivity to light and blurry vision. Inflammation of the conjunctiva causes injection (dilation of conjunctival vessels) and in some cases chemosis (conjunctival edema). Discharge may be seen in viral, bacterial, or allergic conjunctivitis. Discharge varies from mild to severe in bacterial conjunctivitis, but usually appears purulent and persists throughout the day. Meibomian gland secretions in the medial canthus that accumulate during sleep and are not present during the day should not be confused with true discharge. Bacterial conjunctivitis is commonly classified according to its clinical presentation: hyperacute, acute, or chronic.

Hyperacute bacterial conjunctivitis presents with the rapid onset of conjunctival injection, eyelid edema, severe, continuous, and copious purulent discharge, chemosis, and discomfort or pain. *N gonorrhoeae* is a frequent cause of hyper acute conjunctivitis in sexually active patients; the patient usually also has *N gonorrhoeae* genital infection, which is often asymptomatic. *N gonorrhoeae* conjunctivitis also occurs in neonates, as noted above. The cornea is frequently involved, and untreated cases can progress within days to corneal perforation. Unlike most other types of conjunctivitis, gonococcal conjunctivitis should be treated as a systemic disease, with both systemic and topical antibacterial therapy [3].

Acute bacterial conjunctivitis typically presents abruptly with red eye and purulent drainage without significant eye pain, discomfort, or photophobia. Visual acuity does not typically decrease unless large amounts of discharge intermittently obscure vision.

Chronic bacterial conjunctivitis, i.e, red eye with purulent discharge persisting for longer than a few weeks, is generally caused by *Chlamydia trachomatis*.

Treatment

There are three main goals of treating conjunctivitis:

1. Increase patient comfort.
2. Reduce or lessen the course of the infection or inflammation.
3. Prevent the spread of the infection in contagious forms of conjunctivitis.

Systemic treatment needed for gonococcal or chlamydial infections

Treatment consists of both topical and oral antibiotics. Neisseria gonorrhoeae is associated with a high risk of corneal perforation. The Center for Disease Control and Prevention (USA) recommended treating gonococcal conjunctivitis with ceftriaxone 1 g in a single intramuscular dose plus topical saline lavage of the eye [17,18]. It is recommended that sexual partners of the patient must be referred for evaluation and treatment, as should mothers of affected neonates and the mother's sexual partners.

Trachoma which is caused by *Chlamydia trachomatis* subtypes A through C is the leading cause of blindness, affecting about 40 million people worldwide in areas with poor hygiene.19 Presenting signs and symptoms in this condition may be mucopurulent discharge and ocular discomfort. Late complications such as scarring of the eyelid, conjunctiva, and cornea may lead to loss of vision. 19 Chlamydial conjunctivitis is also treated with systemic antibiotics. Treatment with a single dose of oral azithromycin (20 mg/kg) is effective. Patients may also be treated with topical antibiotic ointments for 6 weeks (erythromycin or tetracycline). Alternatively, systemic antibiotics other than azithromycin, such as tetracycline or erythromycin for 3 weeks, may be used [19]. In neonates, the treatment is the same as for pneumonia caused by *C. trachomatis*: erythromycin taken orally for 14 days. It has been recommended by some authors that *H. influenzae* conjunctivitis should also be treated with systemic antibiotics, as it is frequently associated with concurrent otitis media [20].

Topical antibiotics hasten cure

Other types of bacterial conjunctivitis usually resolve spontaneously: early placebo-controlled studies have shown that more than 70% of cases of bacterial conjunctivitis resolve within 8 days [21]. However, treatment with antimicrobial agents results in faster clinical and microbiological cure [22] and reduces the chance of rare complications [23] and of transmitting the infection. Many topical antibiotics are effective for treating bacterial conjunctivitis

(Table 2) [24,25], but there is no firm rule about which one to use because no significant differences have been found in clinical outcomes with different agents [24] Factors like cost, local antibiotic resistance data, and risk of adverse effects should be considered.

Bacitracin
Chloramphenicol
Ciprofloxacin
Gatifloxacin
Gentamicin
Levofloxacin
Moxifloxacin
Neomycin
Ofloxacin
Polymyxin B
Sulfacetamide
Tobramycin

Table 2: Topical antibiotics used for the treatment of bacterial conjunctivitis.

Is culture necessary?

Culture remains the gold standard for the diagnosis of bacterial conjunctivitis. However, a predictable set of organism's accounts for most cases of bacterial conjunctivitis in out- patient settings, so most of the physicians start empiric therapy without culturing the conjunctiva. But in the hospital settings the organisms and their antimicrobial resistance patterns are more varied, so culturing the conjunctiva before starting broad-spectrum therapy may be warranted [16]. For an outpatient with possible hyper acute conjunctivitis, it is reasonable to perform a Gram stain in the office if the facilities exist, but it is not essential because urgent referral to a consultant ophthalmologist is mandatory regardless of the results to rule out corneal involvement.

Unfortunately, increase in antibiotic resistance has been documented even among outpatients. Susceptibility of the most common ocular pathogens to ophthalmic antibiotics has dropped dramatically: *S. aureus* and *S. pneumoniae* have developed high rates of resistance [26]. Recent studies have shown that treatment with topical ophthalmic antibiotics can induce resistance among colonizing bacteria in non-ocular locations [27]. A study conducted in two villages of Nepal demonstrated that widespread systemic treatment with azithromycin or tetracycline for control of endemic trachoma resulted in increased rates of antibiotic resistance among nasopharyngeal isolates of *S. pneumoniae. S. aureus* is becoming resistant to methicillin and to fluoroquinolones, such as levofloxacin [28,29]. It has been estimated that about 3% to 64% of ocular staphylococcal infections are due to methicillin-resistant *Staphylococcus aureus* (MRSA) conjunctivitis; this condition is becoming more common and the organisms are resistant to many antibiotics [30]. Patients with suspected cases must to be referred to an ophthalmologist and treated with vancomycin [31]. But fluoroquinolones are still effective against most bacteria that cause conjunctivitis or keratitis, and because they penetrate the cornea well, they should be used if clinical features suggest corneal involvement. It should be remembered that majority of the patients recover without treatment even if the organism has appreciable antibiotic resistance [24].

Patient Education

Patient education is the most important aspect in prevention of bacterial conjunctivitis, patient education should include good hygiene (e.g., washing hands thoroughly and frequently with soap and water or alcohol rub) and avoidance of touching the eyes, especially after exposure to infectious people. Patient must be made understand that practicing good hygiene is the best way to control the spread of conjunctivitis. Patients should be advised to discard eye cosmetics, particularly mascara and not to anyone else's eye cosmetics or personal eye-care items. Patients with bacterial conjunctivitis who wear contact lenses should be instructed to temporarily stop wearing their lenses while the condition is active. An ophthalmologist can guide the patient if this is necessary. If one develops conjunctivitis due to wearing contact lenses, ophthalmologist may recommend switching to a different type of contact lens or disinfection solution. An ophthalmologist might recommend changing contact lens prescription to a lens that one can replace more frequently. This will help in the prevention of conjunctivitis from recurring.

Patients suffering from bacterial conjunctivitis should be advised not to touch their eyes with hands. In order to prevent the transmission of the disease it is very important to educate patients about their infectious nature and the importance of finishing their antibiotic regimen. Patients should also change their towel and wash cloth daily and should not share them with others. Patients must follow their ophthalmologist's instructions on proper contact lens care.

Conclusion

Patient education is the most important aspect in prevention of bacterial conjunctivitis. Bacterial conjunctivitis is a contagious condition until the eyes are no longer red and there is no discharge, so patients are instructed in proper hygiene and hand washing. It is of utmost importance that children and adults with conjunctivitis must stay away from school, child care or work until it is better. It is important to wash hands with soap and water after touching the child, disposal of tissues after single use and not sharing towels. Majority cases of acute bacterial conjunctivitis are self-limited and will recover within 10 days without any treatment. Patients should be advised to use cool compresses and artificial tears two-six times daily as a supportive therapy for conjunctivitis. Antibiotic treatment will decrease the duration of symptoms and speed the elimination of different microorganisms from the conjunctival surface.

Bibliography

1. Van Weert HC., *et al*. "A new diagnostic index for bacterial conjunctivitis in primary care. A re-derivation study". *European Journal of General Practice* 20 (2014): 202-208.

2. Tipple MA., *et al*. "Clinical characteristics of the afebrile pneumonia associated with Chlamydia trachomatis infection in infants less than 6 months of age". *Pediatrics* 63 (1979): 192-197.

3. De Toledo AR and Chandler JW. "Conjunctivitis of the new born". *Infectious Disease Clinics of North America* 6 (1992): 807-813.

4. Buznach N., *et al*. "Clinical and bacterial characteristics of acute bacterial conjunctivitis in children in the antibiotic resistance era". *The Pediatric Infectious Disease Journal* 24 (2005): 823-828.

5. Bodor FF. "Conjunctivitis-otitis syndrome". *Pediatrics* 69 (1982): 695-698.

6. Crum NF., *et al*. "An outbreak of conjunctivitis due to a novel unencapsulated Streptococcus pneumoniae among military trainees". *Clinical Infectious Diseases* 39 (2004): 1148-1154.

7. Gigliotti F., *et al*. "Etiology of acute conjunctivitis in children". *The Journal of Pediatrics* 98 (1981): 531-536.

8. Weiss A., *et al*. "Acute conjunctivitis in childhood". *The Journal of Pediatrics* 122 (1993): 10-14.

9. Block SL., *et al*. "Increasing bacterial resistance in pediatric acute conjunctivitis (1997-1998)". *Antimicrobial Agents and Chemotherapy* 44 (2000): 1650-1654.

10. Singer TR., *et al*. "Conjunctival anaerobic and aerobic bacterial flora in paediatric versus adult subjects". *British Journal of Ophthalmology* 72 (1998): 448-451.

11. Kato T and Hayasaka S. "Methicillin-resistant Staphylococcus aureus and methicillin-resistant coagulase-negative staphylococci from conjunctivas of preoperative patients". *Japanese Journal of Ophthalmology* 42 (1998): 461-465.

12. Nakata K., *et al*. "A high incidence of Staphylococcus aureus colonization in the external eyes of patients with atopic dermatitis". *Ophthalmology* 107 (2000): 2167-2171.

13. Kluytmans J., *et al*. "Nasal carriage of Staphylococcus aureus: epidemiology, underlying mechanisms, and associated risks". *Clinical Microbiology Reviews* 10 (1997): 505-520.

14. Kowalski RP., *et al*. "Infectious disease: changing antibiotic susceptibility". *Ophthalmology Clinics of North America* 16 (2003): 1-9.

15. Haas J., *et al*. "Epidemiology and diagnosis of hospital acquired conjunctivitis among neonatal intensive care unit patients". *The Pediatric Infectious Disease Journal* 24 (2005): 586-589.

16. Tarabishy AB., *et al*. "Bacterial culture isolates from hospitalized pediatric patients with conjunctivitis". *American Journal of Ophthalmology* 142 (2006): 678-680.

17. Centers for Disease Control and Prevention, Workowski KA, Berman SM. Sexually transmitted diseases treatment guidelines 2006". *MMWR Recommendations and reports* 55 (2006): 1-94.

18. Haimovici R and Roussel TJ. "Treatment of gonococcal conjunctivitis with single-dose intramuscular ceftriaxone". *American Journal of Ophthalmology* 107 (1989): 511-514.

19. Avery RK and Baker AS. "Albert and Jakobiec's Principle and Practice of Ophthalmology". 3rd edition Saunders Elsevier Philadelphia (2008): 4791-4801.

20. Bodor FF. "Systemic antibiotics for treatment of the conjunctivitis-otitis media syndrome". *The Pediatric Infectious Disease Journal* 8 (1989): 287-290.

21. Gigliotti F., *et al*. "Efficacy of topical antibiotic therapy in acute conjunctivitis in children". *The Journal of Pediatrics* 104 (1984): 623-626.

22. Sheikh A and Hurwitz B. "Topical antibiotics for acute bacterial conjunctivitis: Cochrane systematic review and meta-analysis update". *British Journal of General Practice* 55 (2005): 962-964.

23. Aung T and Chan TK. "Nosocomial Klebsiella pneumoniae conjunctivitis resulting in infectious keratitis and bilateral corneal perforation". *Cornea* 17 (1998): 558-561.

24. Baum J and Barza M. "The evolution of antibiotic therapy for bacterial conjunctivitis and keratitis: 1970-2000". *Cornea* 19 (2000): 659-672.

25. Schlech BA and Alfonso E. "Overview of the potency of moxifloxacin ophthalmic solution 0.5% (VIGAMOX)". *Survey of Ophthalmology* 50 (2005): S7-S15.

26. Chalita MR., *et al*. "Shifting trends in in vitro antibiotic susceptibilities for common ocular isolates during a period of 15 years". *American Journal of Ophthalmology* 137 (2004): 43-51.

27. Gaynor BD., *et al*. "Topical ocular antibiotics induce bacterial resistance at extraocular sites". *British Journal of Ophthalmology* 89 (2005): 1097-1099.

28. Marangon FB., *et al*. "Ciprofloxacin and levofloxacin resistance among methicillin-sensitive Staphylococcus aureus isolates from keratitis and conjunctivitis". *American Journal of Ophthalmology* 137 (2004): 453-458.

29. Goldstein MH., *et al*. "Emerging fluoroquinolone resistance in bacterial keratitis: a 5-year review". *Ophthalmology* 106 (1999): 1313-1318.

30. Shanmuganathan VA., *et al*. "External ocular infections due to methicillin-resistant Staphylococcus aureus (MRSA)". *Eye (Lond)* 19.3 (2005): 284-291.

31. FreidlinJ., *et al*. "Spectrum of eye disease caused by methicillin-resistant Staphylococcus aureus". *American Journal of Ophthalmology* 144.2 (2007): 313-315.

Volume 2 Issue 11 November 2018