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Review paper

Comprehensive Review of Conjunctivitis: Etiology, Diagnosis, Clinical Differentiation, and Evidence-Based Management

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Abstract: One of the most common eye diseases observed in primary care and ophthalmology is conjunctivitis, which accounts for more than 1% of all primary care visits and places a significant financial strain on the healthcare system. To distinguish it from other potentially vision-threatening causes of red eye, a comprehensive clinical assessment is required due to its many etiologies, which include viral, bacterial, allergic, toxic and systematic disease-associated types. The current research on conjunctivitis' epidemiology, risk factors, clinical manifestation, diagnostic techniques, and treatment compiles in this review. Given the clinical overlap and frequent misinterpretation, special attention is paid to differentiating infectious from non-infectious forms and viral from bacterial etiologies. The limits of laboratory diagnostics advancements, especially PCR and fast antigen detection, are examined. Conjunctivitis associated with severe mucocutaneous conditions such Stevens-Jhonson syndrome, reactive arthritis, rosacea, and graft-versus-host disease are also discussed in the review. Evidence-based recommendations and possible risks are taken into consideration when evaluating current treatment options, including the function of antibiotics, antivirals, corticosteroids, immunomodulators, and supportive medicines. Reducing needless antibiotic usage, avoiding problems, and enhancing patient outcomes all depend on an understanding of the various presentations and suitable management techniques.

Key words: Conjunctivitis, Red eye, Ocular Infection, Diagnosis, Antibiotics

Introduction

Swelling and inflammation of the conjunctivital tissue, together with ocular discharge, blood vessel enlargement, and malaise, are the hallmarks of conjunctivitis. Conjunctivitis affects a lot of people all over the world and is one of the most common reasons people attend general medical and ophthalmology clinics. According to reports, non-ophthalmologists such as family physicians, internists, nurse practitioners and pediatricians diagnose more than 80% of all cases of acute conjunctivitis (Ansong et al., 2025). This takes up a significant number of office visits to many medical disciplines and puts a significant financial burden on the healthcare system. In the US alone, treating bacterial conjunctivitis is expected to cost $857 million per year (Schneeweiss et al., 2022). In acute conjunctivitis, about 60% of patients are administered with eye drops and clinicians who are not ophthalmologists write most of these prescriptions. For example, compared to 68% of patients who consulted a doctor in an emergency room; antibiotic eye drops were given to 36% of individuals who consulted an ophthalmologist. Interestingly, individuals from higher socioeconomic classes had a greater likelihood of being more acceptable to prescribe conjunctivitis medication (Ansong et al., 2025). Conjunctivitis is categorized in several ways, including severity, genesis, chronicity, and extent of surrounding tissue involvement. Conjunctivitis may have a non-infectious or infectious cause. The most prevalent non-infectious

causes of conjunctivitis are allergies and toxin-induced conjunctivitis; viral conjunctivitis is the most common cause of infectious conjunctivitis, followed by bacterial conjunctivitis. Conjunctivitis is categorized as either acute, which has a quick start and lasts less than 4 weeks, chronic, or subacute, it extends beyond four weeks (Satish et al., 2024). Additionally, a person's conjunctivitis may be categorized as severe if they have severe symptoms and a lot of mucopurulent discharge. The participation of the nearby tissue includes the cornea and eyelid margins, in viral keratoconjunctivitis and blepharoconjunctivitis, respectively, may be linked to conjunctivitis. Conjunctivitis may also be linked to systemic conditions such as immune related diseases (e.g., Reiter's, Stevens-Johnson syndrome (SJS), congenital metabolic syndromes (Richner Hanhart syndrome and porphyria), Sicca in, and keratoconjunctivitis rheumatoid arthritis), deprivation (vitamin nutritional A deficiency) (Table 1) (Kuypers et al., 2025; Shukla et., 2022).

Distinguishing "red eye" caused by conjunctivitis that might have serious or fatal implications, such as uveitis, anterior segment tumors, endophthalmitis, carotid cavernous fistula, cellulitis, and acute angle closure glaucoma is crucial.

Table 1: Guidelines for distinguishing between the main causes of conjunctivitis.

Medical Background	Causes
Symptoms	
Reduced vision, agonizing pain, anisocoria, orbital symptoms and an uncomfortable pupillary reaction	Orbital, parasellar, keratitis, glaucoma, scleritis, or uveitis
Persistency	
Abrupt start that lasts for fewer than four weeks Chronic course, subtle onset Recurring course	Acute systemic responses, allergic conjunctivitis, and infectious conjunctivitis. Toxic conjunctivitis, allergic conjunctivitis, and conjunctivitis linked to systemic illnesses. Conjunctivitis linked to systemic illnesses and allergic conjunctivitis.
Related Symptoms	
Oropharyngeal lesions, genito-perineal involvement, skin lesions, and arthropathy	Conjunctivitis linked to infectious and systemic illnesses.
Drug History	
Using eye drops for a long time Recently started using a systematic drug	Allergic conjunctivitis, toxic conjunctivitis. Acute systemic reactions.

Diagnosis of Conjunctivitis

Conjunctival injection, frequently mentioned to as "red eye", is a classical representation for various ocular disorders and accounts for up to 1% of visits to primary care (Sonawane et al., 2023). Clinicians, regardless of whether they work as ophthalmologists or not, they should be conscious that "red eye" can be a sign of earnest eye conditions like keratitis, uveitis, or scleritis, or it can be a symptom of more favorable circumstances that only affect the conjunctival tissue, like subconjunctival hemorrhage or conjunctivitis. There was a common perception that eye conditions that were more hazardous were linked to visual problems, incapacitating discomfort, and photophobia (Sonawane et al., 2023). However, anisocoria and mild photophobia were found to be strongly linked to "serious eye conditions" in a current comprehensive meta-analysis (Sonawane et al., 2023); 59% of cases with "serious eye conditions", such as anterior uveitis and keratitis, may be identified by the presence of these two symptoms. The primary causes of "red eye" and its clinical features are summed up in Table 2.

Table 2: Certain causes of red eye that are not conjunctivitis.

Diagnosis	Symptoms	Findings
Dry eyes	FB feeling and burning. Usually temporarily, the symptoms worsen when reading or watching TV since there is less blinking. Because of increased evaporation,	Redness on both sides, meibomian glands dysfunction, reduced tear break-up time, tiny tear meniscus, and superficial punctate keratopathy.

	symptoms worsen in dry, cold and windy conditions.	
Pterygium	Frequent redness of the eyes.	Conjunctival extension that is visible above the cornea.
Anterior segment tumors	Flexible	Adaptable
Contact lens overwear	Relevant background	Defect in corneal epithelium
Scleritis	Diminished eyesight and moderate to severe discomfort.	Redness and a blue scleral color
Angle closure glaucoma	Vomiting, light sensitivity, nausea, Headaches, eye discomfort, diminished vision, and seeing haloes around lights. Typically, symptoms are unilateral.	Ocular redness with limbal injection and a firm eye when palpated. The cornea appears foggy or steamy, and the pupils are moderately dilated and lightly unresponsive.
Endophthalmitis	Severe discomfort, photophobia, or a history of ocular injuries or eye surgery	Puss in the anterior chamber, redness, and photophobia.

Difference Between Non-Infectious and Infectious Conjunctivitis

To make the right diagnosis, it is essential to get a patient's history when they have conjunctivitis. The following ought to be included in a targeted ocular history, the duration and the onset of the symptoms, impairment of vision, laterality, presence of itching; history of contact lens wear; other tourists' presence, including recent upper respiratory infections, lymphadenopathy and sinusitis, prior conjunctivitis episodes; systemic allergies and medications; and history of chemical agent exposure. The differential diagnosis can be further reduced by the existence of constitutional symptoms including fatigue, fever, malaise and conjunctivitis sufferers. It is crucial to perform a physical examination, which includes feeling for palpable lymph nodes, particularly in the submandibular and periauricular regions. To ascertain the kind of discharge, an ophthalmic examination should be carried out. The structure on the surface of the eye, such as symblepharon, the corneal tissue for opacities and infiltrates and the palpebral conjunctiva for pseudomembranes, papilla, or follicles must be examined more closely using a slit-lamp biomicroscope. Infectious conjunctivitis can be diagnosed using a variety of clinical signs and symptoms, such as the subsequent: conjunctival injection, eye discharge, red eyes, morning lashes sticking together, grittiness of the eye or eyes, conjunctival or eyelid edema, and past interaction with conjunctivitis patients (Katsimpris et al., 2023). Underdiagnosis and undertreatment of allergic conjunctivitis may occur (Tariq et al., 2024). It manifests as redness, chemosis, and itching without any discernible corneal damage (Villegas et al., 2021). Conjunctival hyperemia is frequently out of proportion to the degree of conjunctival edema. Giant papillae in the superior tarsal conjunctiva and intense itching are the primary signs of vernal keratoconjunctivitis (VKC) (Leonardi et al., 2021), whereas conjunctival scarring and anterior subcapsular cataracts support the prognosis of atopic keratoconjunctivitis (AKC) (Petrillo et al., 2025). A preliminary papillary conjunctival response and then a follicular response, watery discharge, punctate corneal epithelial degradation, and eyelid dermatitis, are some of the symptoms of another related illness called chronic toxic conjunctivitis (Anchala et al., 2025; Suárez-Cortés et al., 2024; Jasim et al., 2024).

Bacterial Conjunctivitis Versus Viral Conjunctivitis

An incorrect diagnosis can frequently be made when attempting to determine the underlying cause of conjunctivitis based just on the symptoms and indications that are now present. According to one research, the precision rate of correctly diagnosing adenoviral conjunctivitis among facilities with competence in ocular surface diseases was just 48% (Amjad et al., 2024). Only 50% of suspected instances of bacterial conjunctivitis had bacterial pathogens identified, according to several further research (Suuronen et al., 2023). Furthermore, research found that up to 52% of suspected instances of viral conjunctivitis had bacterial cultures (Amjad et al., 2024). The following clinical history and conjunctivitis aetiology connections were thought to be valid in the past; these concepts were discussed in several textbooks and used to patient selection in numerous clinical studies (Rietveld et al., 2003). For instance, involvement of one eye followed by involvement of the second eye within 24 to 48 hours is indicative of a bacterial infection, according to the major ophthalmology textbooks (e.g., Krachmer, Duane, and Kanski); however, a viral etiology should be taken into

consideration if the second eye becomes infected after 48 hours with an accompanying enlarged periauricular lymph node. The same textbooks state that while a follicular conjunctival reaction is more likely to indicate a viral aetiology, a papillary conjunctival reaction or pseudomembranous conjunctivitis implies a bacterial origin for conjunctivitis.

Although there isn't much solid clinical proof, there are several additional hypothesized connections between conjunctivitis's origin and symptoms. For example, it has lately been questioned whether bacterial conjunctivitis and the lack of irritation are related. A history of conjunctivitis with bilateral eye involvement in favor of viral and allergic conjunctivitis but not bacterial conjunctivitis, fever, fatigue, malaise, and sinusitis in favor of bacterial conjunctivitis, and recent upper respiratory tract infection and lymphadenopathy in favor of viral conjunctivitis are other associations that were once believed to be true but lack evidence. No clinical studies connecting the symptoms of conjunctivitis to its underlying cause were found in a 2003 meta-analysis (Rietveld et al., 2003). Prospective research that followed the meta-analysis discovered that a mix of 3 symptoms, bilateral eyelid mattering, absence of itching, and no prior conjunctivitis history were highly predictive of bacterial conjunctivitis (Karunarathna et al., 2025). Itching or a prior incident of conjunctivitis decreased the likelihood of a positive bacterial culture, but having both eyes matter and their lashes stick together in the morning was a greater predictor. Furthermore, no kind of conjunctivitis was identified by the symptoms, such as watery, mucous, or purulent discharge. Patients with purulent discharge or mild to severe red eye were less likely to benefit from topical antibiotics, according to a more recent meta-analysis that examined the clinical data of 622 participants from three clinical studies (Liu et al., 2025). This finding confirms that there is typically no significant relationship between conjunctivitis's underlying cause and its symptoms. Another recent study from 2013 discovered that patients who had "gluing of the eyelids" when they woke up in the morning and who were older than 50 at presentation had a high chance of having positive bacterial cultural findings (Hope et al., 2022).

Laboratory Findings

Discharge samples from conjunctivitis-affected eyes may be collected by clinicians and sent for the analysis of microbes. In cased with suspected infectious recurrent conjunctivitis, newborn conjunctivitis, conjunctivitis with a significant purulent discharge, treatment-resistant conjunctivitis, and cases suspected of gonococcal or chlamydial infection, conjunctival cultures are often maintained (Akasaki et al., 2022). Discharge swabs should ideally be collected before beginning antimicrobial therapy. On order to obtain cultures, in the laboratory, the swabs are then placed on various growth medium. Immunocompromised individuals and those with persistent blepharitis should use Sabouraud agar plates for fungal identification. Additionally, anaerobic culture plates could be beneficial, particularly for those who have had prior surgery or trauma (Drew et al., 2015). Antimicrobial treatment should be discontinued 48 hours prior to acquiring cultures if it has already begun. 138 pediatric ocular surface infections were studied during a five-year period, coagulase-negative staphylococci were the most common pathogens, followed by Staphylococcus aureus and Pseudomonas aeruginosa (Bari et al., 2025). Numerous PCR assays for virus identification are available, and it is possible to use nucleic acid amplification methods that need certain swabs to diagnose viral infections. The outcomes of more current research indicate a high degree of specificity but relatively modest sensitivity, between 39.5% and 50% (Shorter et al., 2022), despite original reports from quick antigen testing for adenoviruses conducted in-office that showed up to 94% specificity and 89% sensitivity (Akasaki et al., 2022). Because of its inadequate sensitivity, it may be recommended that real-time PCR be used to validate negative Adeno-Plus test findings. Although assays for identifying higher in vitro levels of certain serum IgE and skin scratch tests or intradermal injections of common allergens may be utilized for those suspected of having allergic conjunctivitis, allergic conjunctivitis is still diagnosed clinically.

Conjunctivitis Caused by a Virus

Viral conjunctivitis, which frequently follows adenovirus inoculation of the ocular surface, is the most frequent reason for infectious conjunctivitis (Hope et al., 2022; Liu et al., 2022). Other viruses, such as herpes simplex virus, enterovirus, and varicella zoster virus, have been studied as potential causes of conjunctivitis caused by viruses (Taha et al., 2022).

Adenoviral Conjunctivitis

Adenoviruses are responsible for up to 90% of viral conjunctivitis cases globally (Shrestha et al., 2024). Recent developments in human adenoviruses (HAdV) genome sequencing have identified over 72 different HAdV genotypes, which are categorized into 7 distinct species (HAdV-A through HAdV-G). HadV-D is the species with the greatest number of members and the best correlation with viral conjunctivitis (Sing et al., 2015; Aljohani et al., 2021). Pharyn-

goconjunctival fever (PCF) is caused by HadV types 4, 7 and 3, which is possibly the most prevalent kind of adenovirus in children (Huang et al., 2024; Harley et al., 2001; Allaq et al., 2023). Pharyngitis, acute follicular conjunctivitis, periauricular lymphadenopathy, and fever are typically present in this illness. Other ocular surface symptoms brought on by the interaction of conjunctival vasculature and pro-inflammatory cytokines include hyperemia, petechial hemorrhages, and edema of the conjunctiva (Figures 1, 2 and 3) (Harley et al., 2001). Without any therapy, this self-limited disease frequently goes away on its own in two to three weeks.

Figure 1: Bilateral eye redness with visible conjunctival inflammation and subconjunctival hemorrhage, consistent with conjunctivitis.

Figure 2: Conjunctival hyperemia with localized hemorrhagic areas, indicative of infectious conjunctivitis.

Figure 3: Bilateral conjunctival redness and watery discharge consistent with viral conjunctivitis.

The most serious ocular symptom of adenoviral infections is epidemic keratoconjunctivitis (EKC), which damages the cornea and conjunctiva. It results in long-lasting and irreversible alterations to the ocular surface as well as vision impairments. Corneal subepithelial infiltrates (SEI), conjunctival discharge, development of conjunctival membranes corneal scarring, follicular conjunctivitis, symblepharon formation and pseudo membranes are among the ocular symptoms of EKC. In the past, EKC was thought to be associated with serotypes 8, 19, 37 and less frequently, serotype 4. However, more recently, the majority of EKC cases are thought to be caused by HAdV-D53 and HAdV-D54, which have been discovered in several outbreaks (Aljohani et al., 2021). In the tarsal conjunctiva of EKC patients, pseudomembrane sheets of fibrin-rich exudates devoid of blood or lymphatic arteries may be seen (Mallik et al., 2023). In EKC, acute conjunctival membranes may also develop, depending on the degree of inflammation. True membranes can result in subepithelial fibrosis and symblepharon once they are developed. Additionally, they can bleed heavily after removal (Chintakuntlawar et al., 2010). Another tissue that EKC may impact is the cornea. Following superficial punctate keratopathy, isolated areas of epithelial opacities may arise from viral replication in the corneal epithelium (Chigbu et al., 2010). Focal SEI in the anterior stroma of the cornea appears seven to ten days after the eyes are initially affected by EKC (Miro et al., 2021). Astigmatism, visual disturbance, and photophobia may be linked to these opacities, which can last for years. According to reports, the incidence of SEI development in EKC ranges from 49.1% to 80% (Hussain et al., 2024). The production of SEIs is thought to be caused by an immune reaction of anterior stromal ker-

atocytes to the multiplying adenoviruses. The idea is supported by the finding that these opacities return after stopping steroids (Arici et al., 2021). Adenovirus conjunctivitis can spread up to 50% of the time, according to certain data (Shukla et al., 2024; Udeh et al., 2008). One research found that viral cultures taken from the hands of up to 46% of patients with viral conjunctivitis were positive. Contaminated medical equipment, contaminated swimming pool water, infected fingers, and the exchange of personal items can all transmit the infection (Kopke et al., 2021). According to reports, the adenovirus is particularly resilient creature that can withstand 3% hydrogen peroxide and 70% isopropyl alcohol (Gordon et al., 1993). The American Academy of Ophthalmology advises disinfecting office supplies and equipment against common infectious organisms found in eye care clinics, such as adenoviruses, using a 1:10 diluted bleach solution (sodium hypochlorite) (Corbett et al., 2025). Owing to the extremely infectious nature of viral conjunctivitis, it has been advised to wash hands often, thoroughly disinfect medical equipment, and separate conjunctivitis patients from other patients in the doctor's office (Voinescu et al., 2025). After getting the adenovirus, people who are affected can spread the illness for up to 14 days. The virus takes 5 to 12 days to incubate (Shukla et al., 2024). Although there isn't a single effective therapy for viral conjunctivitis, using antihistamine-containing eye drops, cold compresses, or artificial tears often seems to reduce many of the symptoms. Oral and topical antiviral drugs don't seem to be helpful (Cheung et al., 2024; Bobykin et al., 2025). Furthermore, antibiotic eye drops have little effect on viral conjunctivitis and may potentially mask the symptoms by causing ocular surface toxicity (Amjad et al., 2024; Suuronen et al., 2023). Increased bacterial resistance and the potential for cross-contamination through tainted bottles to convey the illness to the contralateral eye are additional issues with taking antibiotic drops (Udeh et al., 2008). After anesthetizing the ocular surface, at the slit-lamp, membranes or pseudomembranes can be peeled utilizing cotton swabs or a set of jeweler forceps. This is done to ease the patient's agony and stop scarring in the future. The use of povidone-iodine 2% as a monotherapy for viral conjunctivitis has been studied in pilot studies. In three-quarters of the eyes, the authors found that applying topically 2% povidone-iodine 4 times a day for a week completely resolved the condition (Seyedpiran et al., 2023). According to the American Academy of Ophthalmology, topical corticosteroids are useful in treating conjunctivitis, but they should only be used sparingly and carefully in certain situations (Cheung et al., 2024). Membrane development and sub-epithelial infiltration linked to acute photophobia and impaired vision are indications for the use of steroids in viral conjunctivitis. The primary side effects of indiscriminate topical corticosteroid usage include prolonging the duration of adenoviral conjunctivitis, aggravating HSV keratitis, and raising intraocular pressure. Reports have been made regarding prolonged viral shedding after corticosteroid monotherapy (Dang et al., 2021); but combination treatments using corticosteroids and anti-infective drugs (i.e., antibiotics) have shown promise in the treatment of bacterial and viral conjunctivitis (Taha et al., 2025; Youssef et al., 2022). Ophthalmic I/dexamethasone compositions are substantially studied in PVP. The results indicate that the combination treatments, PVP-I 1.0% dexamethasone 0.1%, PVP-I 0.4% dexamethasone 0.1% suspension, and PVP-I 0.6% dexamethasone 0.1%, significantly alleviate symptoms of the patient and get rid of the virus (Dang et al., 2021; Shah et al., 2025; Pepose et al., 2018). For the treatment of SEIs, the use of 1 and 2% cyclosporine-A (CsA) eye drops has been recommended. It has been shown to be successful in minimizing infiltrates and relieving patient symptoms (Aljohani et al., 2021; Levinger et al., 2010). Nevertheless, Jeng et al. indicated that once patients started taking CsA, it would be difficult to completely waen them off; in their experiment, SEIs reappeared when CsA was withdrawn, requiring the reinstatement of the CsA eye drops (Jeng et al., 2011). These results compared to Reinhard's pilot trial, in which stopping the CsA drops did not result in a recurrence (Gouider et al., 2021). The incidence of corneal opacities was considerably reduced in a small trial with 39 patients when 1% cyclosporine-A was administered for 21 days, 4 times a day during the acute stage of viral conjunctivitis (Imparato et al., 2022). To determine the best tapering schedule for cyclosporine-A and to examine its efficacy, as case-controlled, double-blind randomized clinical study is required. For the treatment of SEIs brought on by adenoviral kerato conjunctivitis, topical tacrolimus eye drops have also been studied. 60% of instances showed a substantial decrease in the size and quantity of SEIs after using ointments or tacrolimus eye drops for an average of 6 months, while 31.76% of eyes showed no SEIs after a year (Kim et al., 2022). Additionally, those who used topical tacrolimus showed a significant increase in their visual acuity.

Herpetic Conjunctivitis

It is estimated that 1.3-4.8% of the cases of acute conjunctivitis are caused by HSV infection (Cronau et al., 2010; Chen et al., 2023; Aramă et al., 2020). Vesicular sore on the surface of the eyelids and a thin, watery discharge may accompany unilateral follicular conjunctivitis, which is frequently caused by HSV. Topical antiviral drugs such as vidarabine, ganciclovir, trifluridine and idoxuridine are used in treatment. The goal of the treatment is to decrease viral

shedding and the risk of developing keratitis. Particularly when the 1st and 2nd branches of the trigeminal nerve are impacted, the herpes zoster virus can produce conjunctivitis in 41.1% of cases, eyelid lesions in 45.8%, uveitis in 38.2%, and corneal lesions such as SEIs, pseudodendrites and nummular keratitis in additional 19.1% of instances (Szeto et al., 2017; Lo et el., 2019).

Acute Hemorrhagic Conjunctivitis

Acute hemorrhagic conjunctivitis (AHC) is a highly infectious type of viral conjunctivitis. Excessive weeping, foreign body sensation, edema of the eyelids, chemosis, dilation of conjunctival vessels, and subconjunctival bleeding are some of its symptoms. Fever, exhaustion, and leg discomfort may follow in a tiny percentage of individuals. The pathogens are thought to be two picornaviruses, enterovirus 70 (EV70) and coxsackievirus A24 variants (CA24v), together with some adenovirus subtypes (Ung et al., 2020; Langford et al., 2015; Zhang et al., 2017). AHC is thought to be mostly spread via infected fomites and contact between hands and eyes, just like the other types of conjunctivitis. The illness is self-limiting; symptoms progressively lessen after the first week of infection and go away entirely after ten to fourteen days (Langford et al., 2015). Medical intervention mainly seeks to manage big outbreaks and undertake preventative measures to protect vulnerable populations, including the pregnant women, children, immunocompromised persons, and the elderly, by encouraging regular handwashing and minimizing contact with the sick patients (Zhang et al., 2017).

Miscellaneous Viral Conjunctivitis

Pox-2 virus induced multiple papular and umblicated skin lesions are indicative of a Molluscum contagiosum (MC) infection. The main ways of transmission are through sexual activity and skin to skin contact. The viral proteins from the eyelid lesions shed into the tear film, causing punctate keratopathy, subepithelial pannus, and persistent follicular conjunctival reaction. Conjunctival primary MC lesions are rare (Langford et al., 2015). The ebolavirus species is the cause of the deadly illness known as Ebola hemorrhagic fever. There have been reports of tears, subconjunctival bleeding, and conjunctival injections in the affected patients (Ohimain et al., 2021). Conjunctival injections, which are often bilateral and present in up to 58% of patients, have been associated with both the acute and late stages of this disease. Conjunctival injection may be crucial in the early detection of this potentially fatal disorder (Eghrari et al., 2021). Although body fluids can carry the virus from person to person, fruit bats are assumed to be the natural reservoir (Raab et al., 2021). A large family of viruses known as coronaviruses mostly affects animals, however certain types can infect people (Dwyer et al., 2023). Since it discovers in China in December 2019, the most current coronavirus strain, known as "2019 nCoV" has garnered media attention. Fever, coughing, dyspnea, and even more mortality have been linked to COVID-19 (Huang et al., 2020; Karimi et al., 2020). According to some studies, conjunctivitis may result from this infection and speed through an infected person's conjunctival secretions. When treating patients with respiratory symptoms and conjunctivitis, all medical professionals including ophthalmologists should exercise caution, particularly if the patient has recently been to high-risk areas (Karimi et al., 2020).

Bacterial Conjunctivitis

Although it is less prevalent in adults, bacterial conjunctivitis is more common in children than viral conjunctivitis (Haidar et al., 2024). Bacterial conjunctivitis can result from both direct contact with infected individuals and abnormal development of the native conjunctival flora (Shields et al., 1991). Contaminated fomites (Blondeau et al., 2021), contaminated fingers (Shukla et al., 2024) and oculogenital spread (Cheung et al., 2024) are common routes of infection. Additionally, a few conditions, such as reduced tear production, disruption of the natural epithelial barrier, anomalies of adnexal structures, trauma and immunosuppressive drugs, enhance the likelihood of developing bacterial conjunctivitis (Cheung et al., 2024). Acute bacterial conjunctivitis is most frequently caused by Moraxella catarrhalis, Streptococcus species, Staphylococcus species, gram-negative gut bacteria and Haemophilus influenza (Høvding et al., 2008). S. pneumonia or H. influenza can cause small outbreaks in younger children. Acute bacterial conjunctivitis presents mild conjunctival hyperemia, increased ocular sensation, and a foreign body feeling. About 90% of people with bacterial conjunctivitis may have itchy and sticky eyelids, according to several investigations on the condition (Abdassah et al., 2019; Shivaji et al., 2024). Less frequent symptoms like eye burning and purulent discharge accompany these outcomes. H. influenza conjunctivitis may be associated with upper respiratory tract infections and acute otitis media (Høvding et al., 2008). Consequential problems are quite uncommon (Schiebel et al., 2003), and spontaneous healing

happens within one to two weeks in over 60% of patients (Honkila et al., 2022). However, a high bacterial population on the conjunctiva increases the patient's chance of developing keratitis, especially in conditions such as dry eye that are connected to corneal epithelial abnormalities (Høvding et al., 2008). Topical antibiotics reduce the duration of the disease, although the results of the treatment and placebo groups are not significantly different. In a meta-analysis involving 3,673 individuals from 11 randomized clinical trials, antibiotic medication increased the rate of clinical improvement by 10% when compared to a placebo (Abdassah et al., 2019). This investigation includes both '2 to 5' and 6 to 10' day regimes. None of the placebo groups in the meta-analysis showed any signs of vision-threatening issues (Zhou et al., 2022), even though extremely pathogenic bacteria can seriously harm the eye and the ocular surface (Shields et al., 1991). In treating bacterial conjunctivitis, all broad-spectrum antibiotic eye drops appear to be successful, and it is doubtful that different antibiotics would significantly differ in their ability to provide a clinical cure. Cost, patient allergies, resistance trends, and geographical availability all affect the choice of antibiotics. Topical antibiotics were more effective in achieving clinical and microbiological cures in patients with positive bacterial cultures according to a major systematic study (Akasaki et al., 2022). However, when the antibiotics were given at varying frequency, no discernible variation in the clinical cure rate was seen (DeCory et al., 2020; Kumar et al., 2024). Topical steroids should be avoided since they prolong the disease and intensify the infection (Table 3) (Cheung et al., 2024).

Table 3: Treatment of acute bacterial conjunctivitis with medication.

Antibiotic	Treatment
Macrolides Aminoglycosides	
Erythromycin	4 ×/d for a week
Azithromycin	2 ×/d for two days; followed by one drop per day for five days
Aminoglycosides	
Tobramycin	Ointment: 3 ×/d for a week
Gentamicin	Ointment: 4 ×/d for a week, one or two drops of the solution 4 ×/d for a week
Sulfonamides	
Sulfacetamide	Ointment: 4 ×/d and before bed for a week Solution: 1-2 drops every 2-3 hours for a week
Combination drops	
Trimethoprim/polymyxin B	For one week, one or two drops at 4 ×/d
Fluoroquinolones	
Gatifloxacin	3 ×/d for a week
Moxifloxacin	3 ×/d for a week
Besifloxacin	For one week, one drop 3 ×/d

Conjunctivitis Linked to Systematic Diseases

In certain circumstances, a comprehensive history and systematic assessment may aid in the early detection of several potentially incapacitating and even fatal disorders since conjunctivitis may be the first symptom of many systematic diseases.

Reactive Arthritis

One of the most prevalent visual signs of reactive arthritis is conjunctivitis; uveitis, episcleritis, scleritis, and keratitis are additional related ocular conditions (Szamocki et al., 2016). Purulent discharge and conjunctival hyperemia are the symptoms of conjunctivitis in reactive arthritis entities. Conjunctivitis, which affects over one-third of patients, is a crucial component of the "Reiter's triad" (Giraudo et al., 2025). Because of its modest clinical appearance, conjunctivitis is frequently overlooked and typically occurs early during reactive arthritis, sometimes even before it. Usually, the symptoms go away in one to four weeks, but occasionally, more serious issues with the ocular surface may develop (Hamdulay et al., 2006).

Rosacea

The inflammatory progression of rosacea in the eyes may potentially impact the ocular surface. Clinical signs include interpalpebral conjunctival hyperemia and a follicular and papillary conjunctival reaction. Additionally, these individuals may have cicatrization of the conjunctival tissue, which resembles trachoma. Ten percent of patients have been documented to have conjunctival scarring because of entropion and trichiasis. Other signs of ocular rosacea include pinguecula, conjunctival granuloma, peripheral corneal infiltration, phlyctenule, and phlyctenule (Sing et al., 2022).

Graft-versus-host disease

Although conjunctival involvement is infrequent in acute graft versus host disease (GVHD), although its existence is indicative of a poor prognosis and more severe systematic involvement. In GVHD, conjunctival involvement can vary from moderate conjunctival injection to cicatrizing and pseudomembranous conjunctivitis (Chatterjee et al., 2023; He et al., 2024). Ulcerative conjunctivitis is frequently seen in severe GVHD and presents with many intermittent bouts of conjunctival bleeding and exudative discharge. Other observations in this syndrome include scarring, pseudomembrane formation, and sterile purulent discharge (Chatterjee et al., 2023). One-fourth to three-fourths of patients with the chronic type of GVHD experience dry eyes, and the severity of this condition is correlated with the severity of GVHD (Jeppesen et al., 2025). After GVHD remission, keratoconjunctivitis sicca often persists (Bourdin et al., 2025). The literature has identified four phases of conjunctival GVHD. A straightforward conjunctival injection is used to identify stage 1. An exudative reaction, which might result in conjunctival chemosis, is the hallmark of stage 2. Most patients are diagnosed at stage 3, which is marked by the production of pseudo-membranes. Scarring and cicatrization of the conjunctival tissue are signs of stage 4 (Chatterjee et al., 2023; Bourdin et al., 2025).

Stevens-Jhonson Syndrome and Toxic Epidermal Necrolysis

The acute stages of Stevens-Johnson syndrome (SJS) and toxic epidermal necrolysis (TEN) can cause conjunctival hyperemiatonear-completes loughing of the palpebral conjunctiva and lid margins. According to reports, up to 88% of cases have acute ocular involvement (Hassanpour et al., 2025). However, the degree of ocular involvement differs between TEN and SJS is still unknown. Corneal limbal stem cell deficit, severe dry eyes, symblepharon development, and corneal scarring are among the long-term negative effects of ocular surface illness after the acute stage (Chow et al., 2017).

Conclusion

Conjunctivitis accounts for around 1% of all patient visits to primary care physicians, and infectious conjunctivitis is thought to cost the US healthcare system over $800 million a year (Schneeweiss et al., 2022). When treating a patient with suspected conjunctivitis, the first step is to rule out significant ocular disorders that resemble conjunctivitis by presenting as “red eye”. To achieve this, a comprehensive history must be obtained, along with a complete physical and ophthalmologic examination. Imaging and ancillary laboratory tests are crucial elements in the assessment of these individuals. While depending only on the symptoms and indicators that are currently deceptive and frequently result in an incorrect diagnosis, numerous studies have shown that getting a complete history is crucial to reducing the differential diagnosis and identifying the underlying aetiology for conjunctivitis. The most prevalent causes of infectious conjunctivitis are bacterial conjunctivitis and viral conjunctivitis (Amjad et al., 2024; Hope et al., 2022; Abdassah et al., 2019). Most instances of viral conjunctivitis are caused by adenoviruses (Shrestha et al., 2024), and diagnosing adenoviral conjunctivitis with a fast antigen test may be a suitable way to prevent antibiotic misuse. About 60% of culture-positive cases of conjunctivitis are reported to be self-limited (Høvding et al., 2008), and bacterial pathogens are detected in half of the cases (Cronau et al., 2010). Patients who do not react to treatment and those who are suspected of having hyperacute conjunctivitis and chlamydial infection should have their conjunctival swabs cultured (Cheung et al., 2024). Topical antibiotic treatment is often advised for contact lens wearers and suspected instances of gonococcal and chlamydial conjunctivitis (Cronau et al., 2010; Høvding et al., 2008). Seasonal allergies account for most occurrences of allergic conjunctivitis. Mast cell stabilizers and antihistamines are frequently used to treat allergic conjunctivitis. Steroids should only be taken when necessary and with caution. The potential for systematic illnesses and the negative effects of preservative-containing eye drops should be considered for individuals with persistent conjunctivitis.

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