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A review of the eye flu or viral conjunctivitis and its associated current treatment, management and challenges

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Abstract
The popular disease known as "Eye flu" affects millions of individuals each year throughout the world. It is also referred to as viral conjunctivitis and is a viral infection that causes redness, itching, and irritation of the eyes. Viral conjunctivitis is the most frequent type of infectious conjunctivitis, and it is particularly prevalent in the hot, humid seasons. Conjunctivitis, also referred to as "red eye," is one of the most prevalent ocular conditions seen in ophthalmic emergency rooms. Conjunctivitis was first described in print by S.T. Quellmaz in 1881.Conjunctivitis is an infection of the conjunctiva, and the main causes are viruses, bacteria, allergies, and irritants. Primary care physicians encounter acute infectious causes (viruses and bacteria) of eye diseases most frequently. Clinically, it might be challenging to distinguish between viral and bacterial conjunctivitis. Human adenovirus (HAdV) is the most common cause of viral conjunctivitis, accounting for 65% to 90% of cases. The focus of treatment for viral conjunctivitis produced by an adenovirus should be on symptomatic alleviation using cold compresses and artificial tears. In this review, we discuss how it is treated, managed, and challenged.

Keywords: Eye flu or viral conjunctivitis, pathogenesis, causes, treatment, management, challenges

Introduction
Every year, millions of people worldwide are affected by the common illness known as "Eye flu." It is also known as viral conjunctivitis and is brought on by a number of viruses, is an infection that results in redness, itching, and irritation of the eyes [1]. The most typical type of infectious conjunctivitis is viral, and it is more common during hot, humid seasons [2]. As the symptoms persist for a longer period of time and do not improve with standard treatment, patients experience significant discomfort. If the cornea is affected, it could have aftereffects, and the patient's discomfort and blurry vision might last longer. Patients who have viral conjunctivitis miss a large amount of workdays. Due to the chronic nature of the illness, depression has even been documented in some studies [3]. Eye redness is frequently caused by conjunctivitis, which is also a frequent complaint in primary care, urgent care, and emergency rooms. Any age, group, or socioeconomic status can be impacted by it. In general, non-ophthalmologists like internists, primary care doctors, pediatrician's, and nurse practitioners diagnose more than 80% of all acute cases [4]. The most frequent underlying cause of infectious conjunctivitis is viral conjunctivitis, which is typically brought on by adenovirus infection of the ocular surface [5, 6]. S.T. Quellmaz published the first description of conjunctivitis in 1881 [7]. Viruses, bacteria, allergens, and irritants are the main causes of conjunctivitis, which is an infection of the conjunctiva. The acute infectious causes (viruses and bacteria) are the eye illnesses that primary care physicians face the most commonly. Clinically, bacterial conjunctivitis and viral conjunctivitis are difficult to differentiate (8–10). Conjunctivitis can be categorized in a number of ways, including according to the cause, how severe it is, how long it lasts, and how much surrounding tissue is affected. Conjunctivitis can have an infectious or non-infectious aetiology. The most frequent causes of infectious conjunctivitis are viral conjunctivitis and bacterial conjunctivitis, while allergy and toxin-induced conjunctivitis are among the most prevalent non-infectious aetiologies. Acute conjunctivitis is defined as having a sudden onset and lasting four weeks or less, subacute

conjunctivitis, and chronic conjunctivitis, which lasts more than four weeks [11]. The most common signs of acute infective conjunctivitis are mild photophobia, mild itching, and a feeling of a foreign body. The most noticeable symptoms include crusted eyelids that are frequently matted shut, especially after sleeping, generalized conjunctivitis, and either watery or purulent discharge from one or both eyes, but there is no reduction in visual acuity [12]. Adenovirus causes Epidemic keratoconjunctivitis (EKC) and Pharyngoconjunctival fever (PCF), enterovirus and coxsackievirus induce acute Haemorrhage conjunctivitis (AHC), and herpes simplex virus (HSV) causes herpetic conjunctivitis. Conjunctivitis is also brought on by the Varicella-zoster virus (VZV), measles virus, and mumps virus, but the clinical symptoms linked to these viruses differ slightly from those linked to other viruses producing viral conjunctivitis [13–16]. When the eyes are red, which usually lasts for 10 to 12 days after the commencement of the condition, viral conjunctivitis is extremely contagious (17). In most cases, the clinical symptoms alone are used to make the diagnosis of viral conjunctivitis. Patients may describe how recently they came in contact with someone who had red eyes, or they may describe how recently they experienced upper respiratory infection symptoms. Bilateral or unilateral eye infection is possible. Patients may have photophobia, tears, redness, discharge, and ocular irritation. They may also experience redness and discharge in their eyes [18]. Indicators of acute viral conjunctivitis include punctate keratopathy, epiphora, hyperemia, chemosis, red and swollen eyelids, pinpoint subconjunctival haemorrhages, inferior palpebral conjunctival follicles, painful palpable preauricular lymph nodes, and occasionally a pseudomembranous. Within 1-2 weeks of the conjunctivitis's beginning, subepithelial corneal infiltrates may appear (17). The most prevalent cause of viral conjunctivitis, which accounts for 65% to 90% of infections, is the human adenovirus (HAdV). The genus Mastadenovirus has seven species of HAdVs, ranging from HAdV-A to G, with 85 genotypes. Keratoconjunctivitis is thought to be caused by HAdV Types 3, 4, 8, 37, 54, 56, and 64 (19–21). Direct contact with infected fluids and interaction with insects are the two main ways that the virus is spread. There have been numerous outbreaks of keratoconjunctivitis linked to HAdV recorded globally, with Type 8 being mostly to blame. Studies from India have indicated that Type 2, 3, 4, 6, 7, 8 and 37 are present [11, 22–27].

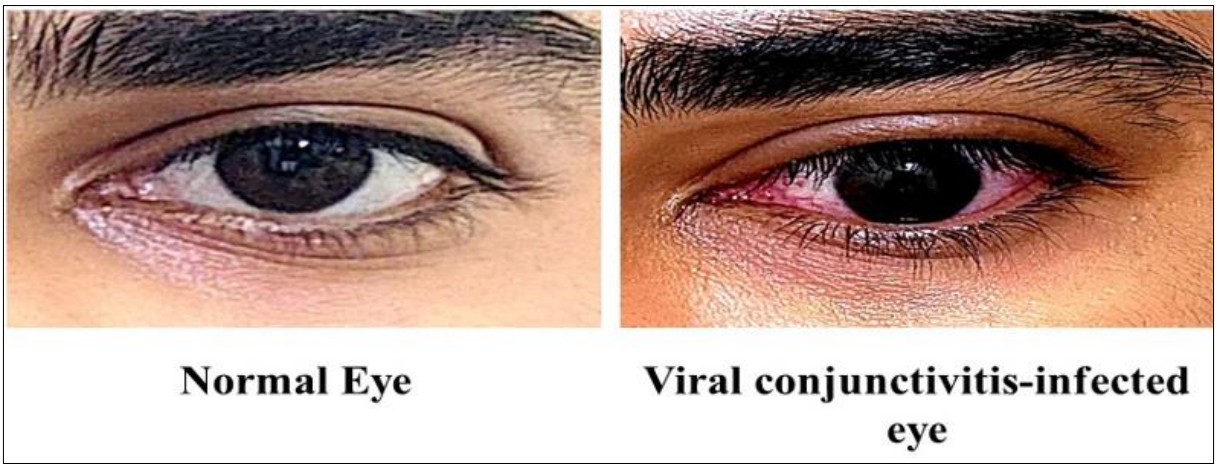

Fig 1: Difference between a healthy eye and a conjunctivitis virus-infected eye

Pathogenesis

Adenoviruses can cause acute conjunctivitis, known as epidemic keratoconjunctivitis (EKC) [28]. In tissue preparations of human adenoids, Rowe *et al*. initially discovered adenoviruses in 1953 [29]. Inflammation of the conjunctiva causes conjunctivitis. Viruses, bacteria, and other pathogens, as well as non-infectious irritants, may be the source of this inflammation. Conjunctival vessels are injected or dilated as a result of this irritation or infection, which causes the familiar redness, hyperemia, and edoema of the conjunctiva. The entire conjunctiva is affected, and discharge is frequent. Depending on the cause, the discharge's quality differs. The conjunctiva's epithelial layer serves as the body's main barrier against infection. Any breach of this barrier can lead to infection [30]. Adenoviruses are non-enveloped, medium-sized (70-100 nm), double-stranded, linear DNA viruses with genomes that are 34–36 kbp in size. The penton base (peak) of the adenovirus is icosahedral in form, and fibres extend from it. Hexon-protein groups are arranged in order to form all triangle faces other than the penton base [31, 32]. Infectious pneumonia, myocarditis, meningoencephalitis, cystitis, and gastroenteritis can all be brought on by adenoviruses. Seven species, ranging from A to G, are used to classify them. EKC is typically brought on by adenovirus species D [27, 33–35]. The highly dangerous adenovirus can occasionally spread throughout offices or schools. Use of contaminated ophthalmic devices and eye treatments, hand-to-eye contact with infected individuals, swimming pools, or fomites in close-contact scenarios are the most common ways that this virus is disseminated. Due to the potential of hospital-acquired EKC infections, which could cause severe epidemics in ophthalmology wards, restrictions on clinical activity, such as delaying eye surgery, releasing hospital inpatients early, and closing ophthalmology wards, may be necessary [36, 37]. Closing a ward can have a significant impact on hospital management. Adenovirus can survive on environmental surfaces for a relatively long time, which raises the chance of transmission. According to O'Brien *et al*., it can spread on surfaces for up to 4-5 weeks [19]. Microscopic investigation of samples obtained by conjunctival scraping reveals a vast array of lymphocyte pathogens. A human adenovirus fast diagnosis tool using immunochromatography debuted in 1996. By chaffing the

conjunctiva with a swab, the sample can be used to identify the adenovirus antigen. The sensitivity is roughly 55%, and the specificity is almost 100% [38].

Symptoms and Signs

Conjunctivitis can cause the eye to become red and irritated on the surface, discharge that may be clear, mucoid, or mucopurulent, eyelids that cling shut (particularly when you first wake up), and swollen papillae under the upper eyelid. Preauricular lymph node hypertrophy is another possibility. Once any discharge has been removed, visual acuity shouldn't be compromised, and if it is, vision should be compromised. Vision distortion, especially when you first wake up in the morning, your eyelashes or lids may be crusty. Fluorescein stains that reveal corneal damage significant photophobia, despite frequent mild photophobia damage to the eyes and a history of trauma, together with limited or painful eye movements [39].

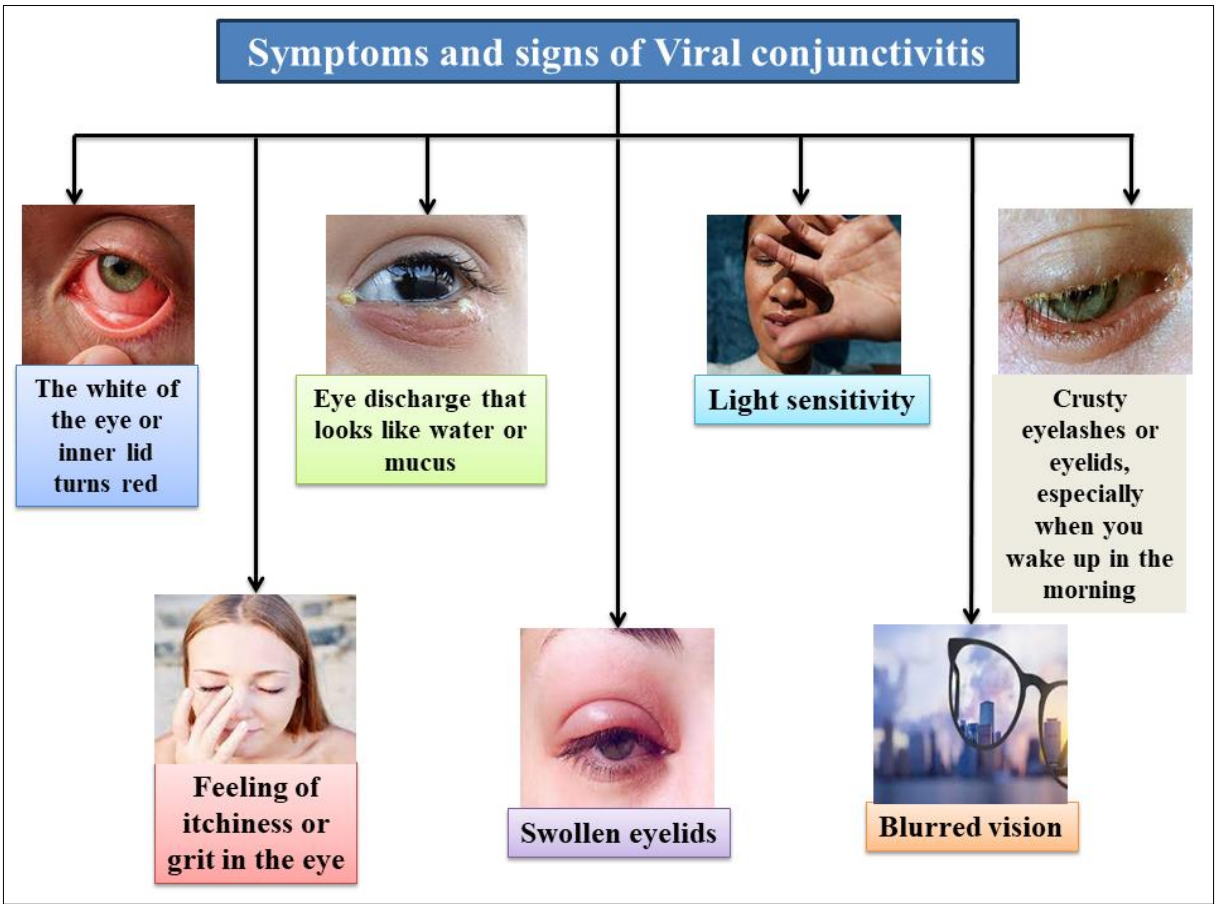

Fig 2: Viral conjunctivitis's symptoms and signs.

Causes of viral conjunctivitis

Adenoviruses are the most common cause of viral conjunctivitis, accounting for up to 90% of cases worldwide [19]. Human adenoviruses (HAdV) contain approximately 72 distinct genotypes that can be grouped into seven different species (HAdV-A through HAdV-G). The HAdV-D species has the most members and the strongest connection with viral conjunctivitis [40, 41]. Pharyngoconjunctival fever (PCF), which is brought on by HAdV types 3, 4, and 7, is one of the adenoviruses that infect children most frequently [42–44]. In the tarsal conjunctiva of EKC patients, pseudomembranes, which are sheets of fibrin-rich exudates devoid of blood or lymphatic capillaries, may be found. True conjunctival membranes may also develop in EKC, depending on the level of inflammation. Once formed, true membranes can cause subepithelial fibrosis and symblepharon, and they frequently bleed profusely when removed [45, 46]. Another tissue that could suffer negative effects in EKC is the cornea. The virus's ability to replicate in the corneal epithelium can result in focal areas of epithelial opacities and superficial punctate keratopathy. About 7 to 10 days after the eyes are first affected by EKC, focal SEI in the anterior stroma of the cornea emerges [47, 48].

Viral conjunctivitis treatment options

Adenovirus-caused viral conjunctivitis is self-limited, hence the focus on treatment should be on symptomatic relief with cold compresses and artificial tears. Patients with adenoviral infections may benefit from taking povidone-iodine 0.8% to lessen their risk of spreading the illness [49].

This new formulation of ocular solution combining povidone-iodine 0.4% and dexamethasone 0.1% is effective in treating adenoviral keratoconjunctivitis, according to Pelletier *et al.*'s open-label pilot human research. Given the widespread usage of these two medications - povidone-iodine and dexamethasone-in the ocular field, a small, open-label human clinical investigation was carried out [50–58].

In a preliminary research, 2% povidone-iodine was applied four times per day for a week, and three-quarters of the eyes recovered [59]. Clinical trials are being conducted with a fixed dosage of dexamethasone and povidone-iodine for EKC. Povidone-iodine 0.6% and dexamethasone 0.1% (PVP-I/dexamethasone) vs. povidone-iodine 0.6% vs.

vehicle (1:1:1) was utilized in a multi-center, randomized double-masked phase II trial in people with adenoviral conjunctivitis in India [60].

Cidofovir 1% was originally seen as promising, however it was not demonstrated to change the course of the disease and produced toxicity and irritation in the conjunctiva and eyelids. In one research, cidofovir was taken both with and without cyclosporine, and it had no impact on how the infection progressed [61–63].

SEI have been treated with cyclosporine A (CsA) alone. The majority of patients with long-standing, established SEI were successfully treated with 2% CsA, resulting in SEI reduction or eradication and successful weaning off medication. According to Jeng *et al*., patients with subepithelial infiltrates following adenoviral keratoconjunctivitis may benefit from using CsA 1% drops [64, 65]. Tacrolimus has also been applied topically for SEI. With a median of nearly a year of follow-up, tacrolimus drops or ointment for a median of six months decreased the quantity and size of SEI in almost 60% of eyes, and in 31.76% of those, SEI were completely removed. Visual acuity improved following treatment in a statistically significant way. After stopping treatment for an average of 7 months, almost 19% of eyes experienced recurrence [66].

Topical tobramycin 0.3%/dexamethasone 0.1% plus ozonized oil eye drops lessen the clinical symptoms and viral titers of suspected viral conjunctivitis more than tobramycin/dexamethasone eye drops by themselves [67].

Antiviral medications including acyclovir, vidaribine, and trifluridine may be involved. Herpes epithelial keratitis can be treated and prevented with gangliclovir ophthalmic gel, 0.15%. Studies have also suggested that ganciclovir has some anti-adenoviral conjunctivitis action. Topical ganciclovir gel was found in clinical trials to be equally effective as acyclovir in treating HSV infection, with improved local tolerance and less cytotoxicity [68].

Ganciclovir (GCV), a synthetic nucleoside analog of 2′-deoxyguanosine, has been proven effective in the inhibition of the herpes family of viruses, specifically herpes simplex types 1 and 2, varicella-zoster virus, cytomegalovirus, and Epstein-Barr. In a series of experiments utilizing Syrian, immunocompromised hamsters infected with HAdV 5, GCV was able to suppress viral replication in the liver, a method that may involve the direct inhibition of DNA polymerase. It was proposed that GCV inhibited the advancement of viral infection into the late phase. Systemically, GCV was able to mitigate the effects of HAdV infection in these hamsters, decreasing the rate of mortality. This led to the investigation of GCV in the treatment of ocular infections of HAdV [69, 70].

Additionally demonstrated to have antiviral efficacy against HAdV in vitro are ribavirin and cidofovir. The majority of these systemic antiviral medications do, however, carry a high risk of serious adverse effects. Acyclic nucleoside phosphonates and nucleotide analogues of cytosine are both components of cidofovir (CDV). It is changed by cells to its diphosphate form, where it interacts to the HAdV DNA polymerase to stop the viral DNA chain and suppress the virus [69, 71].

Although it is a pyrimidine nucleoside like idoxuridine, trifluridine (trifluorothymidine) seems to be more efficient and less harmful. Two of the six studies of trifluridine's effectiveness in treating viral conjunctivitis that we located throughout our search are clinical trials [72, 73].

In response to viral infection, cells naturally create interferons (IFNs), which are intended to stop the spread of viruses. Six clinical analyses investigating the role of IFNs in viral conjunctivitis were found in our search [73–78].

A guanosine analogue with antiviral qualities is aciclovir. Since it does not influence uninfected cells until it is phosphorylated by viral thymidine kinase, it is inactive. Aciclovir is integrated into viral DNA after being phosphorylated and prevents viral multiplication. Herpes simplex virus (HSV) infections can be treated with this well-known medication, which is given topically, orally, or intravenously. There were six trials that used aciclovir to treat conjunctivitis, according to the literature [79–84].

A guanine analogue called famciclovir is often used to treat herpes zoster among other herpesvirus infections. It is a penciclovir prodrug with enhanced oral bioavailability. Regarding herpesviruses, famciclovir exhibits the same antiviral spectrum as aciclovir. Famciclovir has only ever been used in one clinical research to treat viral conjunctivitis [85].

Idoxuridine, a nucleoside analogue that is a modified version of deoxyuridine, is incorporated into viral DNA during replication and prevents base pairing. It functions as an anti-herpesvirus medication. Idoxuridine was initially shown to be an effective treatment for herpetic keratitis in 1962 [81].

- **Use of Steroids**
  When treating viral conjunctivitis, 36.5% of ophthalmologists use steroids at some time, 32.7% indicate they may use steroids in the future, and 30.8% never prescribe steroids. Loteprednol (29.2%), Flurometholone (29.2%), Prednisolone (4.2%), Dexamethasone (6.3%), any other steroid preparation (4.2%), and do not prescribe steroids (27.1%) were the most popular options for steroids [82].
- **Antiviral medication (topical or oral) usage**
  In cases of recurrent viral keratoconjunctivitis, 15.7% of patients reported using topical antivirals. Antivirals were never recommended for the remaining 84.3% of patients. Gancyclovir 0.15% three times a day was the topical antiviral of choice in patients of recurrent viral keratoconjunctivitis [83].
- **Self-Prevention of Viral Conjunctivitis**
  Hand hygiene (washing hands, using a sanitizer like Sterilin, wearing gloves, sanitizing chairs, and other objects) paper strips for the chin Using isopropyl alcohol swabs to clean any potential contact points the patient may have had, avoiding refraction or other treatments, refraining from non-contact tonometry, providing staff and patients with information, and avoiding eye contact (2).

Management of viral conjunctivitis

The features of HAdV and how it interacts with host cells have shown a significant possibility of HAdV escaping the immune response that causes infection. The spread of HAdV into the community and its high contagiousness are factors that have been studied further in relation to its various mechanisms of transmission. Health education among sick patients is an invaluable strategy to stop the spread of an epidemic since large-scale epidemics have significant societal and economic costs. Patients who use preventative techniques must regularly wash their hands with soap, keep them dry, and refrain from touching their

eyes. To prevent the transmission of sickness, parents should encourage their children to stay at home during the infectious phase [84]. Also must be avoided is contact with contaminated towels, soap, bedding, door handles, etc. After the virus has been treated, the sick person's bedding and towels should be thoroughly cleaned and exposed to sunlight (solar UV radiation) to further assure virus eradication [85]. Examining cleaning protocols for ophthalmic instruments is necessary because EKC outbreaks are frequently propagated through ophthalmology clinics. Tonometry probes, the tips of tainted eye drop bottles, and foreign body removal tools are all examples of methods of spread. According to a study comparing the effectiveness of alcohol swabs and hydrogen peroxide disinfection, the former significantly reduced log growth. Disposable prisms are another alternative, however they are frequently expensive and of limited utility. Due to HAdV's widespread distribution, distinct viral traits, and potential for epidemic spread, a number of therapeutic approaches have been researched in an effort to develop an efficient treatment procedure. However, there are currently no antiviral medications for HAdV infections that have received FDA approval [86, 87].

Challenges

The human adenovirus HAdV infects lymphoid and adenoid cells latently as well as lytically, infecting the mucoepithelial cells of the conjunctiva and cornea [88]. Droplets that have been aerosolized are used to spread the HAdV kinds that cause ARD. It is significant to highlight that the transmission dynamics of HAdV infections depend heavily on respiratory droplets, the fecal-oral transmission route, or even post-infection adenoviral shedding from individuals with acute adenoviral infections [89, 90]. Even years after the acute ocular infection has cleared up, persistent HAdV secretions may still be present in the tears. It is possible to generate latent adenoviral infections thanks to the role of T cells in tonsillar and adenoid lymphoid tissue as HAdV reservoirs. By inhibiting the types I and II interferon (IFN) response, which is necessary to stop the production of the HAdV E1A gene, persistent latent adenovirus in the host is likely made more likely to reactivate [89, 91, 92]. TNF-alpha, type I and type II IFN, as well as the production of depleting T cells and NK cells, can all be suppressed by immunosuppressive steroid medication. Inadvertently, this lowers the secretion of antiviral cytokines, which are crucial for preventing virus replication. The HAdV E1A gene can be expressed when the IFN response is inhibited, which leads to the reactivation and replication of the HAdV DNA in epithelial cells connected to latently infected lymphoid tissue and the subsequent spread of HAdV. Therefore, immunosuppression could encourage the spread of adenovirus in the community, especially in immunocompromised children who have never been exposed to or developed immunity to a specific strain of adenovirus. This is because subclinical adenoviral infection of tonsillar and adenoid lymphoid tissue serves as a source of transmitting adenoviruses [93-95]. In a case of two male patients with HAdV D37-related urethritis and conjunctivitis, one of the partners acquired adenoviral conjunctivitis through oculogenital contact, according to Avolio *et al*. These incidents demonstrate how crucial it is to check for the presence of adenovirus in clinical specimens obtained from urethral and conjunctival swabs in male patients who have conjunctivitis, dysuria, and little urethral discharge [96].

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Conclusion and future direction

A description of eye flu or viral conjunctivitis opens each of our review articles. symptoms, and indicators of the disease Causes, Alternatives to current treatment, Virus-related conjunctivitis management, and Challenges. In contrast, non-pharmacological treatment (such as educating staff and patients and avoiding eye contact) yields respectable results but takes time and has no negative effects on the human body. Our review found that while medication does completely cure, it also has negative side effects that can hurt the eye. The management of viral conjunctivitis requires additional randomized controlled studies. In the future, we plan to do an initial inquiry into the illness known as viral conjunctivitis. We are doing a counseling-based research project in our area to evaluate patients' mental and physical health both before and after contracting viral conjunctivitis in order to better understand the condition and possible treatments.

Table 1: Summary of patents on viral conjunctivitis

Patent Number	Year	Disease	Inventor/Applicant/Country	Title of Invention	Ref.
EP2385835B1	2010	Viral conjunctivitis	Europe	Verwendung Von Deuteriumoxid Zur Behandlung Viraler Erkrankungen Des Auges	(107)
US7,504,384 B2	2009	Viral conjunctivitis	Saul Yedgar /United state	Use of Lipid Conugates in the Treatment of Infection	(108)
US7,727,513B2	2010	Viral conjunctivitis	John Gavin MacDonald/United state	Method Forscreening for Bacterial Conuunctivtis	(109)
US10,398,725B2	2019	Viral conjunctivitis	Joseph Capriotti/United state	Ophthalmic Compositions and Methods of Use	(110)
US 10,512,671 B2	2019	Viral conjunctivitis	Rachel R. Caspi/ the united states of america, as represented by the Secretary, Department of Health and Human Service, Bethesda, MD (US)	IL - 24 To treat inflammatory diseases	(111)
US 10,632,147 B2	2020	Viral conjunctivitis	Claire Sampson/ URGO US, INC./ United state	Methods and compositions for Treating inflammatory disorders	(112)
US 10,668,099 B2	2020	Viral conjunctivitis	Keith Goldan/ URGO US, INC./ United state	Methods and compositions for Treating conditions associated with infection and / or Inflammation	(113)
US 11,219,691 B2	2022	Viral conjunctivitis	Jacinth Kincaid Fairley/ Starpharma Pty Limited/United state	Method of treatment or prophylaxis of infections of the Eye	(114)
US11,324,708B1	2022	Viral conjunctivitis	Morten Otto Alexander Sommer/UNION therapeutics A / S/United state	Niclosamide formulations for treating disease	(115)
US11,654,140B2	2023	Viral conjunctivitis	Joe;Kaye/Active biotech AB/United state	Treatment of ocular inflammatory diseases using laquinimod	(116)
US2007/0155700 A1	2007	Viral conjunctivitis	Saul Yedgar/ United state	Use of lipid conjugates in the treatment of conjunctivitis	(117)
US 2008/0103103 A1	2008	Viral conjunctivitis	Bahram Memarzadeh/ United state	Reagents and methods to treat ocular diseases and infection	(118)
US2008/0199498A1	2008	Viral conjunctivitis	Eric R. First/ United state	Methods fortreating eye disorders	(119)
US2018/0221407 A1	2018	Viral conjunctivitis	Chad roy/the administrators of the tulane educational fund, New Orleans, LA(US)	Ophthalmic compositions for therapeutic and prophylactic uses	(120)
US2020/0078335 A1	2020	Viral conjunctivitis	Timothy Paul Foster/The Board Of Supervisors Of Louisiana State University And Agricultural And Mechanical College, Baton Rouge, LA (US)	Compositions and methods to reduce pathogenesis	(121)
US2022/0265783 A1	2022	Viral conjunctivitis	Brian Strem/ Okogen, Inc, Encinitas, CA (US)/United state	Viral conjunctivitis treatment using ranpirnase and / or amphinase	(122)
US2023/0190685A1	2023	Viral conjunctivitis	Morten Sommer union Therapeutics A/S/ United state	Formulation	(123)
WO2007/070181A1	2007	Viral conjunctivitis	macdonald, John, Gavin/ United state	Method for screening for bacterial conjunctivitis	(124)
WO208/053923A1	2017	Viral conjunctivitis	Strem,brian/ okogen, llc/ United state	Viral cojunctivitis treatment using ranpirnase and/or amphinase	(125)
WO2017/212422A1	2017	Viral conjunctivitis	CHURCH, Dennis Joseph/ novartis consumer healtj sa	Topical compositions comprising carbomer for the treatment and prevention of viral infections and allergic conditions	(126)

Table 1: Current status of clinical trials on viral conjunctivitis.

Drug	Mode of administration	Disease	Enrollment	Allocation/Intervention model/Masking	Official Title of the study	Status	Clinical trial	Year
Ketorolac trometamol 0.45% with carboxymethylcellulose & Preservative free artificial tear	Interventional	Viral conjunctivitis	50	Randomized/Parallel Assignment/Triple (Participant Care Provider Investigator)	Artificial Tears Versus Preservative Free Ketorolac Trometamol 0.45% for Treatment of Acute Viral Conjunctivitis	Phase-2 Phase-3	NCT01799863	2015
0.01% Hypochlorous acid & Placebo	Interventional	Viral conjunctivitis	11	Randomized/Single Group Assignment/Double (ParticipantCare Provider)	Avenova for the Treatment of Viral Conjunctivitis	NA	NCT03861728	2021
Dexamethasone 0.1%/povidone-iodine 0.4%/Artificial Tears	Interventional	Viral conjunctivitis	100	Randomized/Parallel Assignment/Triple (Participant Care Provider Investigator)	A Randomized, Double-Masked Trial of Topical Dexamethasone 0.1%/Povidone-iodine 0.4% Versus Artificial Tears for Treatment of Viral Conjunctivitis	Phase-3	NCT01481519	2014
NA	Observational	Viral conjunctivitis	241	NA	Epidemiological, Prospective, Multicentric, Open Study To Assess The Characteristics And Frequency Of Adenoviral Conjunctivitis As Diagnosed With The Point Of Care AdenoPlus® Test In Patients Suffering From Acute Conjunctivitis	NA	NCT03055065	2017
NA	Observational	Viral conjunctivitis	386	NA	Epidemiological, Prospective, Multicentric, Open Study To Assess The Characteristics And Frequency Of Adenoviral Conjunctivitis As Diagnosed With The Point Of Care AdenoPlus® Test In Patients Suffering From Acute Conjunctivitis	NA	NCT02254330	2017
NA	Observational	Viral conjunctivitis	31	Cohort	Epidemiological, Prospective, Multicentric, Open Study To Assess The Characteristics And Frequency Of Adenoviral Conjunctivitis As Diagnosed With The Point Of Care AdenoPlus® Test In Patients Suffering From Acute Conjunctivitis	NA	NCT02112773	2015
NA	Observational	Viral conjunctivitis	240	Cohort	Epidemiological, Prospective, Multicentric, Open Study To Assess The Characteristics And Frequency Of Adenoviral Conjunctivitis As Diagnosed With The Point Of Care AdenoPlus® Test In Patients Suffering From Acute Conjunctivitis	NA	NCT02054273	2017
NA	Observational	Viral conjunctivitis	357	Cohort	Epidemiological, Prospective, Multicentric, Open Study To Assess The Characteristics And Frequency Of Adenoviral Conjunctivitis As Diagnosed With The Point Of Care AdenoPlus® Test In Patients Suffering From Acute Conjunctivitis	NA	NCT02054234	2015
APD-209 Eye drops & APD-209 Placebo Eye drops	Interventional	Viral conjunctivitis	47	Randomized/Parallel Assignment/Triple (Participant Care Provider Investigator)	Evaluation of the Therapeutic Efficacy of APD-209 Eye Drops in Treatment of Acute Phase Adenoviral-Induced Epidemic Keratoconjunctivitis (EKC). A Randomised, Double-Masked, Placebo-Controlled, Multi-Centre Proof-of-Concept Study	Phase-2	NCT01977443	2016
2% povidone-iodine/2% povidone-iodine	Interventional	Viral conjunctivitis	172	Non-Randomized/Single Group Assignment/None (Open Label)	Treatment of Epidemic Keratoconjunctivitis With 2% Povidone-iodine	Phase-4	NCT01179412	2010
FST-100	Interventional	Viral	132	Randomized/Crossover	A Multi-Center, Randomized, Double-Masked Study to	Phase-	NCT01461954	2021

Drug: FST-100 Vehicle		conjunctivitis		Assignment/Quadruple (Participant Care Provider Investigator Outcomes Assessor)	Evaluate the Clinical Efficacy and Safety of FST-100 Ophthalmic Suspension in the Treatment of Acute Viral Conjunctivitis	2		
Ganciclovir & Artificial tear	Interventional	Viral conjunctivitis	33	Randomized/Parallel Assignment/ Double (Participant Investigator)	Ganciclovir 0,15% Ophthalmic Gel in the Treatment of Adenovirus Keratoconjuntivitis	NA	NCT01349452	2011
RPS Adeno Detector IV	Interventional	Viral conjunctivitis	128	N/A/Single Group Assignment/None (Open Label)	A Comparison of the Sensitivity and Specificity of the RPS Adeno Detector IV™ at Detecting the Presence of Adenovirus to Viral Cell Culture.	NA	NCT00921895	2021
IVIEW-1201 & Placebo	Interventional	Viral conjunctivitis	140	Randomized/Parallel Assignment/Double (Participant Investigator)	A Double-Masked, Placebo-Controlled, Randomized, Phase II Clinical Trial To Assess The Efficacy Of IVIEW-1201 In The Treatment Of Acute Adenoviral Conjunctivitis	Phase-2	NCT03749317	2023
Schirmer Test I	Observational	Viral conjunctivitis	25	Case-Control	Tear Fluid miRNA Analysis in Sars-Cov2 Conjunctivitis	NA	NCT04346160	2020
RPS Adeno Detector	Interventional	Viral conjunctivitis	186	Non-Randomized/Single Group Assignment/Single	A Prospective Blinded Multi-center Clinical Trial to Evaluate the Efficacy of the Recently FDA Approved RPS Adeno Detector for Detecting Adenoviral Conjunctivitis	NA	NCT00266734	2010
NA	Observational	Viral conjunctivitis	50	Cohort	Prevalence of SARS-CoV-2 in Conjunctival Swab Samples Among Patients Presenting With Conjunctivitis to the Ophthalmology Clinics During the COVID-19 Pandemic	NA	NCT04374656	2023
Zirgan/genteal gel	Interventional	Viral conjunctivitis	20	Randomized/Parallel Assignment/ Double (Participant Investigator)	A Prospective, Double-masked, Placebo Controlled Comparison of Topical 0.15% Ganciclovir Gel (Zirgan®) Versus 0.3% Hypromellose Gel (Genteal Gel®; Placebo) for the Treatment of Adenovirus Conjunctivitis	Phase-4	NCT01533480	2018
cyclosporine and sodium carboximethycellulose / sodium carboximethycellulose	Interventional	Viral conjunctivitis	20	Randomized/ Parallel Assignment/ None (Open Label)	Topical Cyclosporine for the Treatment of Dry Eye in Patients Infected With the Human Immunodeficiency Virus	Phase-4	NCT00797030	2008

References:

1. Buckner, Frederick S., Anne C. Moore and MSC. Chagas Disease. Travel Trop Med Man E-b 68. 2016;68:2016.
2. Moudgil T, Kaur B, Singh G. Preferred practice patterns of ophthalmologists in management of viral conjunctivitis. Indian J Clin Exp Ophthalmol. 2019;5(3):390–4.
3. Gupta AK, Sarin GS. Serum complement component depression during acute adenovirus conjunctivitis. Br J Ophthalmol. 1984;68(5):350–2.
4. Shekhawat NS, Shtein RM, Blachley TS, Stein JD. Antibiotic Prescription Fills for Acute Conjunctivitis among Enrollees in a Large United States Managed Care Network. Ophthalmology. 2017;124(8):1099–107.
5. Fitch CP, Rapoza PA, Owens S, Murillo-Lopez F, Johnson RA, Quinn TC, *et al*. Epidemiology and Diagnosis of Acute Conjunctivitis at an Inner-city Hospital. Ophthalmology. 1989;96(8):1215–20.
6. Stenson S, Newman R, Fedukowicz H. Laboratory Studies in Acute Conjunctivitis. Arch Ophthalmol. 1982;100(8):1275–7.
7. Neonatorum O. Ophthalmia neonatorum. Ophthalmoscope Press. 1907;
8. Mahajan VM. Acute bacterial infections of the eye: Their aetiology and treatment. Br J Ophthalmol. 1983;67(3):191–4.
9. Sheikh A, Hurwitz B. Antibiotics versus placebo for acute bacterial conjunctivitis. Cochrane Database Syst Rev. 2006;(9).
10. Rietveld RP, Ter Riet G, Bindels PJE, Schellevis FG, Van Weert HCPM. Do general practitioners adhere to the guideline on infectious conjunctivitis? Results of the Second Dutch National Survey of General Practice. BMC Fam Pract. 2007;8:1–7.
11. Madhavan BH. Conjunctivitis (Nursing) [Internet]. StatPearls Publishing, Treasure Island (FL); c2022. Available from: http://europepmc.org/books/NBK568813
12. Wirbelauer C. Management of the red eye for the primary care physician. Am J Med. 2006;119(4):302–6.
13. Ataman Hatipoglu C, Yetkin A, Ertem GT, Tulek N. Unusual clinical presentations of brucellosis. Scand J Infect Dis. 2004;36(9):695–8.
14. Rota PA, Moss WJ, Takeda M, De Swart RL, Thompson KM, Goodson JL. Measles. Nat Rev Dis Prim. 2016;2.
15. Yoshida M, Hayasaka S, Yamada T, Yanagisawa S, Hayasaka Y, Nakamura N, *et al*. Ocular findings in Japanese patients with varicella-zoster virus infection. Ophthalmologica. 2005;219(5):272–5.
16. Meyer RF, Sullivan JH, Oh JO. Mumps conjunctivitis. Am J Ophthalmol. 1974;78(6):1022–4.
17. Pinto RDP, Lira RPC, Abe RY, Zacchia RS, Felix JPF, Pereira AVF, *et al*. Dexamethasone/Povidone Eye Drops versus Artificial Tears for Treatment of Presumed Viral Conjunctivitis: A Randomized Clinical Trial. Curr Eye Res. 2015;40(9):870–7.
18. Solano D, Fu L CC. Viral Conjunctivitis. StatPearls [Internet] Treasure Isl StatPearls Publ 2023 Jan-. 2023;from: http:470271.
19. O'Brien TP, Jeng BH, McDonald M, Raizman MB. Acute conjunctivitis: Truth and misconceptions. Curr Med Res Opin. 2009;25(8):1953–61.
20. Singh MP, Ram J, Kumar A, Rungta T, Gupta A, Khurana J, *et al*. Molecular epidemiology of circulating human adenovirus types in acute conjunctivitis cases in Chandigarh, North India. Indian J Med Microbiol [Internet]. 2018;36(1):113–5. Available from: https://doi.org/10.4103/ijmm.IJMM_17_258
21. Zhou X, Robinson CM, Rajaiya J, Dehghan S, Seto D, Jones MS, *et al*. Analysis of human adenovirus type 19 associated with epidemic keratoconjunctivitis and its reclassification as adenovirus type 64. Investig Ophthalmol Vis Sci. 2012;53(6):2804–11.
22. Madhavan BH. Molecular epidemiology of circulating human adenovirus types in acute conjunctivitis cases in Chandigarh, North India. Indian J Med Microbiol [Internet]. 2018;36(1):113–5. Available from: https://doi.org/10.4103/ijmm.IJMM_17_258
23. Madhavan BH. Isolation of a variant human adenovirus identified based on phylogenetic analysis during an outbreak of acute keratoconjunctivitis in Chennai. Indian J Med Res. 2012;136(2):260–4.
24. Madhavan BH. Development and use of nested polymerase chain reaction (PCR) for the detection of adenovirus from conjunctivitis specimens. J Clin Virol. 1998;11(1):77–84.
25. Madhavan BH. Virology and epidemiology analyses of global adenovirus-associated conjunctivitis outbreaks, 1953-2013. Epidemiol Infect. 2016;144(8):1661–72.
26. Madhavan BH. Human adenovirus: Viral pathogen with increasing importance. Eur J Microbiol Immunol. 2014;4(1):26–33.
27. Madhavan BH. Associated With Antiviral Therapy. Antivir Ther. 2006;55(November 2005):52–5.
28. Kaneko H, Suzutani T, Aoki K, Kitaichi N, Ishida S, Ishiko H, *et al*. Epidemiological and virological features of epidemic keratoconjunctivitis due to new human adenovirus type 54 in Japan. Br J Ophthalmol. 2011;95(1):32–6.
29. Hobby J, Bryson GLW, Bact J, Bartz QR, Controulis J, Crooks HM, *et al*. Cytopathogenic Agent From Human Adenoids Tsolation of a Cytopathogenic Agent from Human Adenoids LTndergoing Spontaneous Degeneration in Tissue Culture. (20714). World Heal Organ Monogr Ser. 1952;64(5):84.
30. O'Callaghan RJ. The pathogenesis of staphylococcus aureus eye infections. Pathogens. 2018;7(1):1–22.
31. Manuscript A. Interactions Among Protein Networks. 2012;329(5995):1038–43.
32. Shieh WJ. Human adenovirus infections in pediatric population - An update on clinico–pathologic correlation. Biomed J [Internet]. 2022;45(1):38–49. Available from: https://doi.org/10.1016/j.bj.2021.08.009
33. Mohamed Ismail A, Zhou X, Dyer DW, Seto D, Rajaiya J, Chodosh J. Genomic foundations of evolution and ocular pathogenesis in human adenovirus species D. FEBS Lett. 2019;593(24):3583–608.
34. Gu Jie, *et al*. Adenovirus diseases: a systematic review and meta-analysis of 228 case reports. Infect 49. 2021;49:6.
35. Lee B, Damon CF, Platts-Mills JA. Pediatric acute gastroenteritis associated with adenovirus 40/41 in low-income and middle-income countries. Curr Opin Infect Dis. 2020;33(5):398–403.

36. Uemura T, Migita H, Ueno T, Tsukahara-Kawamura T, Saeki Y, Fujimoto T, *et al*. Clinical and virological analysis of epidemic keratoconjunctivitis caused by adenovirus type 54 in a regional ophthalmic clinic in Kyushu, Japan. Clin Ophthalmol [Internet]. 2018;12:511–7. Available from: https://doi.org/10.2147/OPTH.S148264
37. Omatsu Y, Miyazaki D, Shimizu Y, Matsuura K, Sasaki S ichi, Inoue Y, *et al*. Efficacy of compartmentalization in controlling an adenovirus type 54 keratoconjunctivitis outbreak on Oki Island, Japan. Jpn J Ophthalmol [Internet]. 2021;65(3):423–31. Available from: https://doi.org/10.1007/s10384-021-00826-8
38. Uchio E, Aoki K, Saitoh W, Itoh N, Ohno S. Rapid diagnosis of adenoviral conjunctivitis on conjunctival swabs by 10-minute immunochromatography. Ophthalmology [Internet]. 1997;104(8):1294–9. Available from: http://dx.doi.org/10.1016/S0161-6420(97)30145-6
39. Everitt H. Acute Conjunctivitis. InnovAiT Educ Inspir Gen Pract. 2009;2(1):44–9.
40. Kuo IC. Adenoviral Keratoconjunctivitis: Diagnosis, Management, and Prevention. Curr Ophthalmol Rep. 2019;7(2):118–27.
41. Singh G, Zhou X, Lee JY, Yousuf MA, Ramke M, Ismail AM, *et al*. Recombination of the epsilon determinant and corneal tropism: Human adenovirus species D types 15, 29, 56, and 69. Virology [Internet]. 2015;485:452–9. Available from: http://dx.doi.org/10.1016/j.virol.2015.08.018
42. Roche P, Merianos A, Antic R, Carnie J, Christensen A, Waring J, *et al*. Tuberculosis notifications in Australia, 1999. Commun Dis Intell. 2001;25(4):254–60.
43. Li J, Lu X, Sun Y, Lin C, Li F, Yang Y, *et al*. A swimming pool-associated outbreak of pharyngoconjunctival fever caused by human adenovirus type 4 in Beijing, China. Int J Infect Dis [Internet]. 2018;75(16):89–91. Available from: https://doi.org/10.1016/j.ijid.2018.08.009
44. Sinclair RG, Jones EL, Gerba CP. Viruses in recreational water-borne disease outbreaks: A review. J Appl Microbiol. 2009;107(6):1769–80.
45. Chintakuntlawar A V., Chodosh J. Cellular and tissue architecture of conjunctival membranes in epidemic keratoconjunctivitis. Ocul Immunol Inflamm. 2010;18(5):341–5.
46. Jhanji V, Chan TCY, Li EYM, Agarwal K, Vajpayee RB. Adenoviral keratoconjunctivitis. Surv Ophthalmol [Internet]. 2015;60(5):435–43. Available from: http://dx.doi.org/10.1016/j.survophthal.2015.04.001
47. Chigbu, D. I. and BAL. Pathogenesis and management of adenoviral keratoconjunctivitis. Chigbu, D I, B A Labib [Internet]. 2018;53(1):1–8. Available from: http://www.tfd.org.tw/opencms/english/about/background.html%0Ahttp://dx.doi.org/10.1016/j.cirp.2016.06.001%0Ahttp://dx.doi.org/10.1016/j.powtec.2016.12.055%0Ahttps://doi.org/10.1016/j.ijfatigue.2019.02.006%0Ahttps://doi.org/10.1016/j.matlet.2019.04.024%0A
48. Colón LE. Keratoconjunctivitis due to adenovirus type 8: report on a large outbreak. Ann Ophthalmol. 1991;23(2):63–5.
49. Monnerat N, Bossart W, Thiel MA. Povidoniod zur behandlung von adenoviruskonjunktivitis: Eine in-vitro-studie. Klin Monbl Augenheilkd. 2006;223(5):349–52.
50. Berkelman RL, Holland BW, Anderson RL. Increased bactericidal activity of dilute preparations of povidone-iodine solutions. J Clin Microbiol. 1982;15(4):635–9.
51. Melki SA, Safar A, Yaghouti F, Scharper P, Scharper M, Zeligs B, *et al*. Effect of topical povidone-iodine versus topical ofloxacin on experimental Staphylococcus keratitis. Graefe's Arch Clin Exp Ophthalmol. 2000;238(5):459–62.
52. Benevento WJ, Murray P, Reed CA, Pepose JS. The sensitivity of Neisseria gonorrhoeae, Chlamydia trachomatis, and herpes simplex type II to disinfection with povidone-iodine. Am J Ophthalmol [Internet]. 1990;109(3):329–33. Available from: http://dx.doi.org/10.1016/S0002-9394(14)74560-X
53. Ferguson AW, Scott JA, McGavigan J, Elton RA, McLean J, Schmidt U, *et al*. Comparison of 5% povidone-iodine solution against 1% povidone-iodine solution in preoperative cataract surgery antisepsis: A prospective randomised double blind study. Br J Ophthalmol. 2003;87(2):163–7.
54. Safar A, Dellimore MC. The effect of povidone iodine flush versus drops on conjunctival colonization before intravitreal injections. Int Ophthalmol. 2007;27(5):307–12.
55. Isenberg SJ, Apt L. The Ocular Application of Povidone-Iodine. Community Eye Heal. 2003;16(46):30–1.
56. Isenberg SJ, Apt L, Valenton M, Del Signore M, Cubillan L, Labrador MA, *et al*. A controlled trial of povidone-iodine to treat infectious conjunctivitis in children. Am J Ophthalmol. 2002;134(5):681–8.
57. Mohan N, Gupta V, Tandon R, Gupta SK, Vajpayee RB. Topical ciprofloxacin-dexamethasone combination therapy after cataract surgery: Randomized controlled clinical trial. J Cataract Refract Surg. 2001;27(12):1975–8.
58. Holland EJ, Bartlett JD, Paterno MR, Usner DW, Comstock TL. Effects of loteprednol/tobramycin versus dexamethasone/tobramycin on intraocular pressure in healthy volunteers. Cornea. 2008;27(1):50–5.
59. Trinavarat A, Atchaneeyasakul LO. Treatment of epidemic keratoconjunctivitis with 2% povidone-iodine: A pilot study. J Ocul Pharmacol Ther. 2012;28(1):53–8.
60. Pepose JS, Ahuja A, Liu W, Narvekar A, Haque R. Randomized, Controlled, Phase 2 Trial of Povidone-Iodine/Dexamethasone Ophthalmic Suspension for Treatment of Adenoviral Conjunctivitis. Am J Ophthalmol [Internet]. 2018;194:7–15. Available from: https://doi.org/10.1016/j.ajo.2018.05.012
61. Gordon, Y. Jerold M.D.; Naesens, Lieve Ph.D.; DeClercq, Erik M.D., Ph.D.; Maudgal, Prabaht C. M.D., Ph.D.; Veckeneer MMD. Treatment of Adenoviral Conjunctivitis with Topical Cidofovir. Cornea 15(5)p 546. 1996;15(September):1996.
62. Gordon YJ, Romanowski EG, Araullo-Cruz T. Topical HPMPC inhibits adenovirus type 5 in the New Zealand rabbit ocular replication model. Investig Ophthalmol Vis Sci. 1994;35(12):4135–43.
63. Hillenkamp J, Reinhard T, Ross RS, Bohringer D. The Effects of Cidofovir 1% with and without Cyclosporin

A 1% as a Topical Treatment of Acute Adenoviral. Ophthalmy. 2002;109(5):845–50.
64. Levinger E, Slomovic A, Sansanayudh W, Bahar I, Slomovic AR. Topical treatment with 1% cyclosporine for subepithelial infiltrates secondary to adenoviral keratoconjunctivitis. Cornea. 2010;29(6):638–40.
65. Okumus S, Coskun E, Tatar MG, Kaydu E, Yayuspayi R, Comez A, *et al*. Cyclosporine a 0.05% eye drops for the treatment of subepithelial infiltrates after epidemic keratoconjunctivitis. BMC Ophthalmol. 2012;12(1):958–61.
66. Prado SB, Riestra Ayora AC, Fernández CL, Rodríguez MC, Merayo-Lloves J, Alfonso Sánchez JF. Topical Tacrolimus for Corneal Subepithelial Infiltrates Secondary to Adenoviral Keratoconjunctivitis. Cornea. 2017;36(9):1102–5.
67. Cagini C, Mariniello M, Messina M, Muzi A, Balducci C, Moretti A, *et al*. The role of ozonized oil and a combination of tobramycin/dexamethasone eye drops in the treatment of viral conjunctivitis: a randomized clinical trial. Int Ophthalmol [Internet]. 2020;40(12):3209–15. Available from: https://doi.org/10.1007/s10792-020-01503-4
68. Thanathanee O, O'Brien TP. Conjunctivitis: Systematic approach to diagnosis and therapy. Curr Infect Dis Rep. 2011;13(2):141–8.
69. Wold WS, Toth K. New drug on the horizon for treating adenovirus. Expert Opin Pharmacother. 2015;16(14):2095–9.
70. Ying B, Tollefson AE, Spencer JF, Balakrishnan L, Dewhurst S, Capella C, *et al*. Ganciclovir inhibits human adenovirus replication and pathogenicity in permissive immunosuppressed syrian hamsters. Antimicrob Agents Chemother. 2014;58(12):7171–81.
71. Huang J, Kadonosono K, Uchio E. Antiadenoviral effects of ganciclovir in types inducing keratoconjunctivitis by quantitative polymerase chain reaction methods. Clin Ophthalmol. 2014;8:315–20.
72. 1993_A prospective masked clinical trial of trifluridine, dexamethasone and at's in the tx of ekc.
73. Hutter H. Keratokonjunktivitis epidemica: Therapieergebnisse während einer Epidemie. Klin Monbl Augenheilkd. 1990;197(09):214–7.
74. Goon P, Wright M, Fink C. Ophthalmic zoster sine herpete. J R Soc Med. 2000;93(4):191–2.
75. Uchoa UBC, Rezende RA, Carrasco MA, Rapuano CJ, Laibson PR, Cohen EJ. Long-term Acyclovir Use to Prevent Recurrent Ocular Herpes Simplex Virus Infection. Arch Ophthalmol. 2003;121(12):1702–4.
76. Rousseau A, Bourcier T, Colin J, Labetoulle M. Herpes Zoster Ophthalmicus—Diagnosis and Management. US Ophthalmic Rev. 2013;06(02):1.
77. Gajdatsy AD, Kosmin A, Barrett GD. Coexistent adenoviral keratoconjunctivitis and Acanthamoeba keratitis. Clin Exp Ophthalmol. 2000;28(6):434–6.
78. Parentin F, Molin GD, D'Agaro P, Busetti M, Campello C. Parinaud's oculoglandular syndrome due to herpes simplex virus type 1. Ocul Immunol Inflamm. 2007;15(2):139–41.
79. Neoh C, Harding SP, Saunders D, Wallis S, Tullo AB, Nylander A, *et al*. Comparison of topical and oral acyclovir in early herpes zoster ophthalmicus. Eye. 1994;8(6):688–91.
80. Trying S, Engst R, Corriveau C, Palestine AG, Rapuano CJ. Famciclovir for ophthalmic zoster: A randomized aciclovir controlled study. Evidence-Based Eye Care. 2002;3(1):30–1.
81. Kaufman HE, Nesburn AB, Maloney ED. Cure of vaccinia infection by 5-iodo-2′-deoxyuridine. Virology. 1962;18(4):567–9.
82. Holland EJ, Fingeret M, Mah FS. Use of Topical Steroids in Conjunctivitis: A Review of the Evidence. Cornea. 2019;38(8):1062–7.
83. Colin J. Ganciclovir ophthalmic gel, 0.15%: A valuable tool for treating ocular herpes. Clin Ophthalmol [Internet]. 2007;1(4):441–53. Available from: http://www.ncbi.nlm.nih.gov/pubmed/19668521%0Ahttp://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=PMC2704535
84. Wang H, Yang S, Liu J, Fu Z, Liu Y, Zhou L, *et al*. Human adenoviruses: A suspect behind the outbreak of acute hepatitis in children amid the COVID-19 pandemic. Cell Insight [Internet]. 2022;1(4):100043. Available from: https://doi.org/10.1016/j.cellin.2022.100043
85. Sun Guangli, *et al*. Analysis on the treatment and prevention of epidemic conjunctivitis in 108 cases. Pakistan J Pharm Sci 30. 2017;30:2017.
86. Omar Akhtar A, Singh H, Si F, Hodge WG. A systematic review and cost-effectiveness analysis of tonometer disinfection methods. Can J Ophthalmol [Internet]. 2014;49(4):345–50. Available from: http://dx.doi.org/10.1016/j.jcjo.2014.04.003
87. Buehler JW, Finton RJ, Goodman RA, Choi K, Hierholzer JC, Sikes RK, *et al*. Epidemic keratoconjunctivitis: Report of an outbreak in an ophthalmology practice and recommendations for prevention. Infect Control. 1984;5(8):390–4.
88. Isolation of Human Adenovirus Type 5 Variants Resistant to the Antiviral Cidofovir. 1996;37(13):2774–8.
89. Lion T. Adenovirus infections in immunocompetent and immunocompromised patients. Clin Microbiol Rev. 2014;27(3):441–62.
90. Chigbu DI, Labib BA. Pathogenesis and management of adenoviral keratoconjunctivitis. Infect Drug Resist. 2018;11:981–93.
91. Ghebremedhin B. Human adenovirus: Viral pathogen with increasing importance. Eur J Microbiol Immunol. 2014;4(1):26–33.
92. Radke JR, Cook JL. Human adenovirus infections: Update and consideration of mechanisms of viral persistence. Curr Opin Infect Dis. 2018;31(3):251–6.
93. Garnett CT, Talekar G, Mahr JA, Huang W, Zhang Y, Ornelles DA, *et al*. Latent Species C Adenoviruses in Human Tonsil Tissues. J Virol. 2009;83(6):2417–28.
94. Hu X, Li WP, Meng C, Ivashkiv LB. Inhibition of IFN-γ Signaling by Glucocorticoids. J Immunol. 2003;170(9):4833–9.
95. Flammer JR, Dobrovolna J, Kennedy MA, Chinenov Y, Glass CK, Ivashkiv LB, *et al*. The Type I Interferon Signaling Pathway Is a Target for Glucocorticoid Inhibition. Mol Cell Biol. 2010;30(19):4564–74.
96. Avolio M, De Rosa R, Modolo ML, Stano P, Camporese A. When should adenoviral non-gonococcal urethritis be suspected? Two case reports. New Microbiol [Internet]. 2014 Jan;37(1):109-112. Available from: http://europepmc.org/abstract/MED/24531179.