

Chapter

COVID-19 Conjunctivitis

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Abstract

The outbreak of new Cov-2 epidemic was detected in December 2019 in the city of Wuhan, China, caused by Severe Acute Respiratory Syndrome Coronavirus –2 and started its rapid spread through the world. The World Health Organisation (WHO) declared a public health emergency of international concern (PHEIC) on the 30th of January 2020. -2 infection can present with spectrum of clinical manifestations, primary of upper respiratory tract and in some cases, especially in immunocompromised patients can cause changes in lower respiratory tract such as pneumonia and bronchitis. Conjunctivitis is not a common manifestation of SARS-Cov-2 infection. It should however be kept in mind that patients with ocular manifestations and symptoms can represent the COVID-19 cases. CoVs can produce several ocular manifestations from conjunctivitis, uveitis – anterior and posterior, retinitis and optic neuritis.

Keywords: SARS-CoV-2, eye infection

1. Introduction

The outbreak of new Cov-2 epidemic was detected in December 2019 in the city of Wuhan, China. It is caused by Severe Acute Respiratory Syndrome Coronavirus –2 (SARS-CoV-2) and started its rapid spread through the world [1]. The World Health Organization (WHO) declared a public health emergency of international concern (PHEIC) on the 30th of January 2020 [2].

CoV-2 infection, among other clinical presentations can also affect the eye and cause conjunctivitis, uveitis – anterior and posterior, retinitis and optic neuritis. In this chapter the CoV-2 ocular surface manifestation are divided in two different divisions- CoV-2 conjunctivitis as a rare and uncommon manifestation of CoV-2 infection and ocular CoV-2 transmission since conjunctiva and conjunctival discharge are detected as a possible route of SARS-Cov-2 transmission.

The data about CoV-2 ocular manifestations are sparse. We analysed the number of publications of conjunctivitis, SARS-CoV-2, COVID 19, ocular manifestations as key words was in PubMed, WoS, and Scopus. Published data are divided into two periods of time, year 2004 and 2005 in the outbreak of the first epidemic of CoVs and the period of recent ongoing epidemic since the outbreak in Dec 2019.

2. Conjunctivitis

CoV -2 infection can present with spectrum of clinical manifestations, primary of upper respiratory tract [3] and in some cases, especially in immunocompromised patients can cause changes in lower respiratory tract such as pneumonia

and bronchitis [4]. Conjunctivitis is not a common manifestation of SARS-CoV-2 infection. However it should be kept in mind that patients with ocular manifestations and symptoms can represent the COVID-19 cases [5]. Coronaviruses (CoVs) can produce several ocular manifestations from conjunctivitis, uveitis – anterior and posterior, retinitis and optic neuritis. The data on the topic are sparse and as the epidemic continues more data should be available and better understanding of the disease is to be achieved [6].

The first reports suggesting CoVs affecting the eye dates from year 2004 and 2005 in patients – primary children with respiratory illness and conjunctivitis. Retrospective studies showed that 17% of patients with CoV-NL63 infection with primary upper and lower respiratory tract illness had developed conjunctivitis [7].

The route of how CoVs ends up in the eye is not yet clear. The possible ways are from infected droplets, migration from the upper respiratory tract through the nasolacrimal duct or hematogenous spread and infection of the lacrimal gland [8, 9]. Most of the data are from the epidemic in 2004 and since the epidemic died down the research did not continue and the questions remained unanswered. The question emerged again the light of the new ongoing epidemic.

In 2020 there has been a report of the first SARS-CoV-2 infected patient with also an ocular infection in Wuhan [10] and it emerged the need to research the topic again [11]. Majority of studies conducted come from China and the first study in Europe was performed by a group of authors from Spain [12]. The frequency of conjunctivitis in COVID-19 disease is not yet specified, with different data from 0.8% in some to 3% in other and up to 31.6% in different studies conducted in China [13–15].

The European, Spanish study showed that 11.6% of the patients diagnosed with COVID 19 presented with some symptoms of conjunctivitis [12].

3. Clinical presentation and differential diagnosis

Mucopurulent discharge, tearing and foreign body sensation, follicular reaction, conjunctival hyperemia and discharge are the most common symptoms of conjunctivitis. The median time of onset of ocular symptoms is 6 days and the duration of symptoms 3 days.

SARS-CoV2 conjunctivitis can be similar to other viral infections mostly adenoviral. SARS-CoV-2 is usually unilateral and unlike one of adenoviral aetiology, rarely bilateral [16]. The onset in both scenarios is abrupt, injection more severe in adenoviral, similar follicular reaction and chemosis. Petechial hemorrhage, corneal infiltrates and membrane and pseudomembrane formation is more often detected in adenoviral conjunctivitis and discharge is more prominent.

There is a low rate of positive PCR test for SARS-CoV-2 RNA in tears and conjunctival discharge in patients with conjunctivitis presuming the false negativity. Also since the symptoms could be mild and patients do not have visual impairment it can go unnoticed the prevalence can be underestimated.

4. Duration and therapy

The duration of SARS-CoV-2 conjunctivitis is usually 3–4 days and it is a rapid self-limited disease. It ceases with no specific treatment. There are no clinical evidence of efficacy of topical antibiotic or corticosteroid therapy. It is sometimes used as a prevention of a bacterial superinfection but it is generally not recommended. Lubricants, gels and ointments can be used as a symptomatic therapy. Potential sequelae are not yet enough investigated.

5. Ocular symptoms and other CoV-2 infection manifestations

The connection between ocular symptoms and severity of pulmonary disease is yet to be investigated. The data in some studies imply that patients with conjunctivitis are more often presented with more severe COVID-19 – higher white blood cells and neutrophil count, levels of procalcitonin, C-reactive protein and lactate dehydrogenase [17]. Some suggestions emphasize the importance of hosts characteristics and site of inoculation.

6. Transmission

Health care workers are at special risk for SARS-CoV-2 infection due to high incidence of long term and repeated exposure, protected as well as unprotected.

Conjunctiva and conjunctival discharge is a possible route of SARS-Cov-2 transmission.

Presence of virus particles in conjunctival swabs, tear swabs and conjunctival scrapings has been investigated in several studies with different outcomes. Case series from Singapore first detected SARS-CoV in tears of 3 of 36 tested patients sampled within 9 days of onset of disease (in the early phase). This case series has important implications for the ophthalmology practice since reported with the detection of the SARS-CoV from tears [18].

Considering the new and ongoing epidemic several studies were conducted in China and analyzed tears and conjunctival secretions from SARS-Cov-2 infected patients. In study conducted in Wuhan 2.8% of tested patients (of 72 tested) were confirmed SARS-CoV-2 RNA in conjunctival discharge [19] while in the study conducted in Hangzhou (on 30 patients) only one sample tested positive on presence of virus in PCR results [20]. Study from Wuhan investigated 67 cases of probable or confirmed COVID-19 infection. They found positive PCR result in one sample of conjunctival swab and two possible positive samples. None of the tested patients had ocular symptoms. The sample was taken from one patient with symptoms of conjunctivitis and the PCR test was negative [21].

The study conducted in Italy (Lombardia) SARS-CoV-2 was found in 57.1% of patients on the ocular surface with a variability of viral load from both eyes [22]. The infectivity of the material was not determined but the results suggested that the test can be positive in conjunctival swab and negative in nasopharyngeal swab.

Authors from Croatia emphasize the importance of early detection of possible ocular manifestations and the need for precaution in order to prevent transmission through ocular secretions [23].

Besides frequent hand washing they emphasize the need for immediate disinfection of ophthalmic instruments, especially those in direct contact with patient's mucosal membranes.

Considering the several study results we can presume that the conjunctiva and ocular surfaces are rarely detected in presence of SARS-Cov-2 but have to be considered and investigated in the future.

7. Conclusion

Ocular manifestations of SARS-CoV-2 infection including conjunctivitis are uncommon. If present, conjunctivitis is usually self-limited disease with mild symptoms and of limited duration. Important but not yet investigated topic is a


presence of CoV in conjunctival swabs in asymptomatic patients and in patients with other manifestations of CoV-2 infection with no ocular symptoms. Potential viral transmission via conjunctival discharge and secretions is yet to be investigated. The importance of precaution in contact with mucosal membranes including conjunctiva has to be emphasised.

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References

- [1] Organisation WH. Coronavirus disease 2019 (COVID19) situation report 32. <https://who.int/docs/default-source/coronaviruse/situation-reports/20200221-sitrep-32-covid-19>
- [2] Organisation WH. Statement on the second meeting of the international health regulations (2005) emergency committee regarding the outbreak of novel coronavirus (2019-n-Cov). <https://www.who.int/news-room/detail/30-01-2020>
- [3] Corman VM, Muth D, Niemeyer D, Drosten C. Hosts and sources of endemic human coronavirus. *Adv Virus Res.* 2018;100:163-188
- [4] Vassilara F, Spyridaki A, Pothitos G, Deliveliotou A, Papadopulos A. A rare case of human coronavirus 229E associated with acute respiratory distress syndrome in healthy adult. *Case Rep Infect Dis.* 2018;2018:6796839
- [5] van Doremalen N, Bushmaker T, Morris DH, Holbrook MG, Gamble A, Williamson BN, et al. Aerosol and surface stability of SARS-CoV-2 as compared with SARS-CoV-1. *N Engl J Med.* 2020.
- [6] Seah I, Agrawal R. Can the Coronavirus Disease 2019 (COVID-19) Affect the Eyes? A Review of Coronaviruses and Ocular Implications in Humans and Animals. *OCULAR IMMUNOLOGY AND INFLAMMATION* 2020, VOL. 28, NO. 3, 391-395 <https://doi.org/10.1080/09273948.2020.1738501>
- [7] Vabret A, Mourez T, Dina J et al. Human coronavirus NL63 France. *Emerg Infect Dis.* 2005;11(8):1225-1229.
- [8] Tong T, Lai TS. The severe acute respiratory syndrome coronavirus in tears. *Br J Ophthalmol.* 2005;89(3):392. doi:10.1136/bjo.2004.054130.
- [9] Chan WM, Yuen KS, Fan DS, Lam DS, Chan PK, Sung JJ. Tears and conjunctival scrapings for coronavirus in patients with SARS. *Br J Ophthalmol.* 2004;88(7):968-969.
- [10] Yan A. Chinese expert who came down with Wuhan coronavirus after saying it was controllable thinks he was infected through his eyes. *China: South China morning post.* <https://www.scmp.com/news/china/article/3047394/chinese-expert-who-came-down-wuhan-coronavirus-after-saying-it-was>. 2020.
- [11] Lu CW, Liu XF, Jia ZF. 2019-nCoV transmission through the ocular surface must not be ignored. *Lancet.* 2020;395(10224):e39. doi:10.1016/S0140-6736(20)30313-5.
- [12] Güemes-Villahoz N, Burgos-Blasco B, García-Feijó J, Sáenz-Francés F, Arriola-Villalobos P, Martínez-de-la-Casa JM, Benítez-del-Castillo JM, Herrera de la Muela M. Conjunctivitis in COVID-19 patients: frequency and clinical presentation. *Graefes Arch Clin Exp Ophthalmol.* 2020 Aug 29 : 1-7. doi: 10.1007/s00417-020-04916-0
- [13] Xia J, Tong J, Liu M, Shen Y, Guo D (2020) Evaluation of coronavirus in tears and conjunctival secretions of patients with SARS-CoV-2 infection. *J Med Virol.* 1-6. 10.1002/jmv.25725
- [14] Zhang X, Chen X, Chen L et al (2020) The evidence of SARS-CoV-2 infection on ocular surface. *Ocul Surf.* 10.1016/j.jtos.2020.03.01
- [15] Wu P, Duan F, Luo C et al (2020) Characteristics of ocular findings of patients with coronavirus disease 2019 (COVID-19) in Hubei Province, China. *JAMA Ophthalmol.* 1-8. 10.1001/jamaophthalmol.2020.1291
- [16] Chen L, Liu M, Zhang Z et al (2020) Ocular manifestations of a hospitalised

patient with confirmed 2019 novel coronavirus disease. Br J Ophthalmol:1-4. 10.1136/bjophthalmol-2020-316304

Vukojevic K, Stevanovic V, Mardesic S, Kosovic I, Vilibic-Cavlek T Ophthalmic manifestations of novel coronaviruses: precautionary measures and diagnostic possibilities; JoGH, 2020 ISGH

[17] Wu P, Duan F, Luo C et al (2020) Characteristics of ocular findings of patients with coronavirus disease 2019 (COVID-19) in Hubei Province, China. JAMA Ophthalmol:1-8. 10.1001/jamaophthalmol.2020.1291

[18] Loon SC, Teoh SC, Oon LL, Se-Thoe SY, Ling AE, Leo YS, et al. The severe acute respiratory syndrome coronavirus in tears. Br J Ophthalmol. 2004;88:861-3. Medline:15205225 doi:10.1136/bjo.2003.035931

[19] Zhang X, Chen X, Chen L, Deng C, Zou X, Liu W, et al. The infection evidence of SARS-COV-2 in ocular surface: a singlecenter cross-sectional study.

[20] Xia J, Tong J, Liu M, Shen Y, Guo D. Evaluation of coronavirus in tears and conjunctival secretions of patients with SARSCoV-2 infection. J Med Virol. 2020.

[21] Zhou Y, Zeng Y, Tong Y, Chen C. Ophthalmologic evidence against the interpersonal transmission of 2019 novel coronavirus through conjunctiva. medRxiv preprint doi:<https://doi.org/10.1101/2020.02.11.20021956>

[22] Azzolini C, Donati S, Premin E, Baj A, Siracusa C, Genoni A, Grossi PA, Azzi L, Sessa F, Dentali F, Severgnini P, Minoja G, Cabrini L, Charavalli M, Veronesi G, Catcano G, Maffioli LS, Tagliabue A, SARS-CoV-2 on Ocular Surfaces in Cohort of Patients With COVID-19 From the Lombardy Region, *JAMA Ophthalmol*. Published online March 4, 2021. doi:10.1001/jamaophthalmol.2020.5464

[23] Konjevoda S, Canovic S, Pastar Z, Tabain I, Savic V, Barbic Lj, Dzelalija B,