

Discussion on Eye Diseases Induced After the New Crown Yangkang

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Abstract

Objective: To explore the ophthalmopathy induced by COVID-19 Yangkang.

Methods: From February to May 2023 in the outpatient department, of 8 diseases (20 cases) induced by COVID-19 Yangkang were investigated. After diagnosis, antiviral and symptomatic treatment will be given, along with medication that supplements eye tissue depending on the condition. In severe cases, temporary use of hormones throughout the body can improve the patient's temporary immune emergency response ability; Individual patients are given prophylactic antibiotics to prevent secondary bacterial infections.

Result: As a result, the condition was quickly brought under control and recovered.

Conclusion: After COVID-19 Yangkang, COVID-19 has not been completely eliminated *in vivo*. COVID-19 does not only invade the lung tissue, it can invade the eyes with blood, nerves, lacrimal passages and other ways, causing diseases such as fundus, uvea, ophthalmic nerve, and eye surface, causing serious damage to the eyes, and even the risk of blindness. It should be highly valued in ophthalmic clinical practice.

Keywords: COVID-19; Yangkang Hou; Eye Disease

Introduction

Novel coronavirus pneumonia (COVID-19) over time, the virus mutates, and it has been found that the novel coronavirus (SARS-CoV-2) can not only cause ocular surface diseases, but also uveitis, retina, ocular nerve and other diseases [1]. Infected people who continue to develop symptoms of eye disease 3 months after COVID-19 turn negative are called Long Covid, and severe cases even have the risk of blinding [2]. Studies have shown that SARS-CoV-2 binds to angiotensin-converting enzyme 2 (ACE2) receptors and is also present in the eye, so it is considered that it may be a route of infection and transmission [3]. However, there is still a lack of scientific consensus on the tendencies and pathologies of eye diseases caused by SARS-CoV-2, which is essential for clinicians to identify signs and symptoms for accurate diagnosis and treatment. Here, we will discuss the 20 cases of eye diseases caused by SARS-CoV-2 in 8 diseases found in outpatients from February ~ May 2023, so as to attract the attention of ophthalmic clinics.

Case Introduction

Sequence number	Disease	Sufferer (Age/Gender)	Initial Visual function	Diagnosis	Rehabilitation (Final Vision Function)
1	Urgent sex Portugal grapes flame	(1) Zhao (52 years old/ female). (2) Zhang (69 years old/ male). (3) Qin (64 years old/ male). (4) Wang (70 years old/ male). (5) Chen (46 years old/ female). (6) Zhu (56 years old/ male).	Light sensitivity, intraocular pressure> 60mmHg 0.3, intraocular pressure 30mmHg 0.4, intraocular pressure 28mmHg 0.5, intraocular pressure 35mmHg 0.6, intraocular pressure 28mmHg 0.2, intraocular pressure 26mmHg	Acute staphylitis of the right eye, secondary glaucoma Acute iridocycloblastitis of the left eye Acute iridoblastic inflammation of the right eye Recurrent cyano-iridescent syndrome in the right eye Acute uveitis of the left eye Acute iridocyclitis in both eyes	Right eye 0.15, intraocular pressure 16 mmHg 0.6, intraocular pressure 18 mmHg 0.8, intraocular pressure 15 mmHg Right eye 0.6+, intraocular pressure 15 mmHg Binocular 1.0, intraocular pressure 18 mmHg Correction 0.5, intraocular pressure 17 mmHg
2	Fundus vein embolism	(1) Wu (63 years old/ male) (2) Wu (61 years old/ male). (3) Gong (65 years old/ male).	Right eye 0.6 Right eye 0.4 0.02 in the right eye, black in the left eye	Embolism of the right fundus branch vein Embolism of the right fundus branch vein Embolism of the central vein of the right fundus	Right eye 0.8 Right eye 06 Right eye 04
3	Glaucoma	Cheng (73 years old/ male).	The right eye is light-sensitive, and the left eye is dark Intraocular pressure> 60mmHg	Glaucoma in both eyes, corneal decompensation of the right eye Atrophy of the optic nerve in the left eye	Right eye 0.15, intraocular pressure 21 mmHg The left eye is black, and the intraocular pressure is 31 mmHg
4	Papillitis	Wu (62 years old/male).	Right eye 02	Papillitis of the right eye	Right eye 05. Intraocular pressure 18mmHg
5	Oculomotor nerve palsy	Li (39 years old/male).	0.8, Double Vision (10)	Oculomotor insufficiency palsy of the left eye	Binocular 0.8, double vision (1)

6	Dry eyes	(1) Don (70 years old/female).	Schirmer: Right 3 mm, left 5 mm	Dry eye syndrome in both eyes	Schirmer: Right 5 mm, left 7 mm
		(2) Chen (85 years old/female).	Schirmer: Right 3 mm, left 4 mm	Dry eye syndrome in both eyes	Schirmer: Right 4 mm, left 5 mm
7	Keratitis	(1) Yu (6 years old/male).	Binocular 0.4	Viral keratitis of both eyes	Binocular 1.0
		(2) Tian (74 years old/male).	0.6 for the right eye and 0.4 for the left eye	Viral keratitis of the left eye	Binocular 0.8
8	Conjunctivitis	(1) Liu (38 years old/female).	Binocular 0.8	Viral conjunctivitis of both eyes	Binocular 1.0
		(2) Xiao (2 years old/female).	Binocular 0.5	Viral conjunctivitis of both eyes	Eyes 05
		(3) Chao (11 years old/male).	Binocular 1.0	Viral conjunctivitis of both eyes	Binocular 1.0
		(4) Zhu (35 years old/female).	Eyes 08	Binocular viral conjunctivitis (Arcturus)	Eyes 08

Table: Note: 1. Nucleic acid testing after “new crown” Yangkang in this group of cases (1); White blood cells and neutrophils were low, and hypersensitivity C-protein response was elevated; 2. After diagnosis, according to the different systemic and topical application of the condition: antiviral, anti-inflammatory, hormone, symptomatic treatment and other drugs; 3. The course of treatment is about 3~10 days ±.

Discussion

With the epidemic of COVID-19, eye diseases caused by SARS-CoV-2 have gradually attracted the attention of ophthalmologists, not only including the new crown Omicron (Omicron.B.1.1.529) virus itself to the eye harm. As we all know, COVID-19 tends to be more severe in patients with underlying diseases such as diabetes, immunological function and poor physical fitness, especially the large use of immunosuppressants increases the possibility of secondary infection, and also creates conditions for hematogenous transmission of endogenous infection foci, which can easily lead to endogenous eye diseases.

Features of endogenous ocular inflammation induced by SARS-CoV-2

Most of the cases in this group were infected with SARS-CoV-2 and nucleic acid [10] in December 2022~January 2023, and symptoms such as eye redness, vision loss and ophthalmic exudation after 2~4 weeks after Yangkang appeared, and nucleic acid was reviewed [1]; Blood routine leukocytes and neutrophils were low, and hypersensitivity C-protein response values were high→ indicating that the disease was active and vulnerable to virus attack. Although the patient’s nucleic acid is [1], it is because the body’s clearance of SARS-CoV-2 still takes a certain amount of time (related to the patient’s constitution and immune resistance). Colavita, *et al.* detected viral RNA in an eye swab with a lower CT value than the nasal swab in a COVID-19 patient who developed ocular manifestations within 21 to 27 days of symptom onset and isolated live virus with replication ability in eye fluid. That is to say, when the “load” of the virus does not reach the “peak” of nucleic acid detection, although the nucleic acid is (one), it is not that SARS-CoV-2 in the body has been completely removed!

Effects of SARS-CoV-2D on uveitis

This group of cases have a clear history of COVID-19, endogenous uveitis occurs within 2~4 weeks after Yangkang, the condition is more acute and serious, and severe cases can cause complications such as secondary glaucoma. For example, cataract phacoemulsification + intraocular lens implantation was performed a few days after Yangkang, although the operation was smooth and the postoperative recovery was good, but in the half month after the operation, the surgical eye red pain and sharp decrease in vision suddenly occurred, and the examination was confirmed as uveitis and secondary glaucoma. If it is caused by "iatrogenic" surgery, it usually occurs within 2~3 days after surgery, except for obvious inflammation in the eye, the blood routine white blood cells and neutrophils are high, while in this case, the white blood cells and neutrophils are not high. In addition, the patient was a "single case" in the "batch" operation, and the body's immune function was poor after considering Yangkang, which was caused by "non-iatrogenic". The hypersensitivity C-protein response value is high, indicating that the intraocular lesions have certain activity and are not easy to be controlled according to conventional treatment. Case 5 patients have a history of "arthritis" in the past, and were infected with "influenza A" in 1 month after Yangkang, although they were infected by different viruses, but their constitution was even weaker, and then induced uveitis, fortunately, the doctor recognized the diagnosis and medication in time, the condition was quickly controlled, most of the flocculent exudation of the anterior chamber was absorbed after 2 days, and the pupils of the posterior adhesions were basically opened, and by the 4th day the anterior chamber exudation was all absorbed, and the vision was restored 1.0. It is recommended that for some patients with elective surgery or underlying diseases, it often takes a while to recover after COVID-19 Yangkang, and Yangkang ≠ complete recovery! Some seemingly asymptomatic patients may also cause eye damage, especially the elderly, and it is advisable to postpone surgery.

Effects of SARS-CoV-2 on retinal diseases

At the 22nd European Meeting of Retinal Experts (Euretina 2022), it was found that SARS-CoV-2 is able to infect the brain and eyes through the trigeminal nerve (TN) and optic nerve (ON) and can cause retinal inflammation and decreased depth perception [5]. SARS-CoV-2 can predispose patients to thrombotic diseases that affect arteriovenous circulation, such as retinal hemorrhage, retinal artery (CRAO)/venous occlusion (CRVO), central serous retinopathy, Pulsha-like retinopathy (PRP), paracentric acute macular degeneration (PAMM), acute macular neuroretinopathy (AMN), etc. Some of them are related to coagulation abnormalities, emboli formation, etc., some are related to ischemia caused by retinal microvasospasm, and some may be related to the neurotropic nature of SARS-CoV-2. Patients may suddenly develop unilateral painless vision loss or blurred vision 2~6 weeks after the first onset of COVID-19 symptoms, regardless of the patient's age or comorbidities, SARS-CoV-2 will greatly affect the onset of CRVO, and mild to moderate retinal hemorrhage is found on fundus examination [6]. Especially if you have underlying diseases such as diabetes, high blood pressure, blood diseases, vascular diseases, etc. the risk of ocular symptoms is higher. For example, patients in this group of seven, eight, and nine patients have other underlying diseases such as high blood pressure, obesity and coronary arteries, which may also put them at higher risk of CRVO. Given the critical importance of early diagnosis and treatment for vision recovery in patients with CRVO, clinicians are advised to consider the diagnosis of CRVO as early as possible in patients with a history of COVID-19 and sudden painless vision loss, taking into account fundus conditions.

Effects of SARS-CoV-2 on ocular nerves

It is well known that the ocular and maxillary branches of TN innervate both the nasal respiratory and olfactory areas, and connect the brain, eyes and TN should be considered a susceptible organ for SARS-CoV-2, which will help us to be vigilant in the diagnosis and treatment of COVID-19-induced eye diseases. If a patient with COVID-19 first suffers from dental neuralgia, and then the glaucoma recurs, high intraocular pressure causes corneal decompensation, it can be inferred that the source of the disease is through TN invasion. Therefore, we believe that TN can be infected by SARS-CoV-2, spreading the virus to the brain and eyes, and that when the virus infection affects the third, fourth, and sixth pairs of cranial nerves, the corresponding ocular muscle movement disorders occur [7,8]. For example, Example 6 reported that after COVID-19, the vision was slightly ghosted, there was no red pain in the eyes, and the diagnosis was not clearly diagnosed after seeking medical treatment in other hospitals, coupled with the inconvenience of epidemic control and medical treatment, the

course of the disease was relatively long, but after detailed medical history, a special examination of the “extraocular muscles” was done, the diagnosis was clarified and the treatment plan was adjusted in time, and the condition was quickly controlled and the diplopia disappeared. Therefore, although the multiple nucleic acid tests after Yangkang are (one), it does not mean that the virus has been completely eliminated, and the remaining virus can be maintained in the body for a long time, and attached to the corresponding tissues and organs, when the body’s immunity declines, it will take advantage of the deficiency to induce eye lesions. According to the definition of clinical cases published by the World Health Organization (WHO), the sequelae of the new crown usually occur within 3 months after the onset of infection with the new crown, and the symptoms last at least 2 months, and cannot be explained by other diagnoses.

Effects of SARS-CoV-2 on ocular surface diseases

Because the nasolacrimal duct has an anatomical connection between the surface of the eye and the respiratory tract, the mutated virus may replicate in the lungs and move through the nasolacrimal duct to the eye, causing anterior segment lesions such as conjunctival hyperemia, lacrimation, and conjunctival edema [9]. In June 2020, Turkish researchers found that within one to six weeks of the occurrence of the above common symptoms, they showed one or more ocular symptoms, such as ocular hyperemia, tears, increased discharge, conjunctival edema, photophobia, pruritus, burning, conjunctivitis, scleritis, trachoma, and blurred vision [10]. Researchers believe that the risk of dry eye-related symptoms in those who have recovered from the new crown infection is significantly higher than that of the general healthy population, and that patients with a higher viral load have a 10% increased risk of dry eye-related ocular surface symptoms [11]. For example, when patient 10 reported suffering from COVID-19, his right eye was red and painful with blurry, and he was diagnosed with glaucoma with optic nerve atrophy and keratitis in its hospital and given corresponding treatment, and the effect was not good. Based on the diagnosis of the previous cases of “viral keratitis”, we quickly clarified the diagnosis and adjusted the treatment plan in time, the condition was quickly controlled and stabilized, the visual acuity increased from light perception to 0.15, and the intraocular pressure was stable. In cases 15 and 16, teachers on campus were first infected with SARS-CoV-2 and then transmitted to children, and conjunctival hyperemia and edema of both eyes appeared, and SARS-CoV-2-induced conjunctivitis was confirmed by examination. Here, I would like to emphasize the importance of epidemic control in accordance with the requirements of hospital infection prevention and control!

Treatment of SARS-CoV-2 ocular diseases

In order to enable patients with eye diseases induced by SARS-CoV-2 to recover as soon as possible, it is necessary to protect the visual function and minimize the occurrence of complications and sequelae. Since there is currently no specific drug for SARS-CoV-2, most of the cases in this group have received conventional antiviral and symptomatic treatment. In severe cases, temporary systemic hormones are added to improve the patient’s temporary immune emergency ability. Antibiotics are added to individual patients to prevent secondary bacterial infections. After treatment, observe whether it is effective, in addition to ocular symptoms, it is also necessary to observe whether blood routine and hypersensitivity C-protein reaction drop to normal. If the lesion is not active and tends to remission, the drug can be reduced; On the basis of a clear diagnosis, drugs to repair and nourish eye tissue are added to promote rapid control and recovery.

Detection of eye inflammation caused by SARS-CoV-2

According to the Department of Forensic Medicine of the Eppendorf Medical Center of the University of Hamburg Medical School in Germany, SARS-CoV-2 is not only limited to the respiratory tract and lung tissue, it can affect systemic diseases of various tissues and organs throughout the body. Detection of the virus in the retina of COVID-19 deaths [12] has been reported, and SARS-CoV-2 has previously been reported in aqueous humor of asymptomatic SARS-CoV-2 infected individuals. These studies provide us with a good insight, and it is easy to understand that the virus can spread with blood into the eye. Nasopharyngeal swabs are used for large-scale nucleic acid testing, and studies have shown that the eyes can also transmit SARS-CoV-2 infection through the lacrimal route, while tears and conjunctival swabs (scrapings) can be used for the diagnosis of SARS-CoV-2 infection in the eyes [13], providing valuable information for the diagnosis

and treatment of diseases. The detection of intraocular fluid can be used as a powerful weapon for follow-up research on the new crown. We must develop a “personalized” clinical response diagnosis and treatment plan according to different clinical situations!

Summary

Through this group of cases, COVID-19 has a new understanding: SARS-CoV-2 can affect all tissues and organs throughout the body, and the transmission route of the eye is explored. After COVID-19 Yangkang, the virus in the body has not been completely eliminated, and the remaining virus is still attached to the corresponding tissues and organs, and when the body’s immunity is low, it will induce eye lesions. In the treatment, it is necessary to protect the visual function and minimize the occurrence of complications and sequelae. SARS-CoV-2 is still mutating, and the ocular lesions induced by SARS-CoV-2 should attract high clinical attention. Since we are limited by certain conditions, although we cannot determine whether SARS-CoV-2 is involved in ocular inflammation, it is necessary to combine the epidemiological history in the process of diagnosis and treatment, make correct diagnosis and personalized treatment, and do a good job in hospital infection prevention and control to ensure medical safety.

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