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## Clinical Examples of the Use of Mercureid Drug in Patients with Ischemic Neuropathy of the Optic Nerve That Appeared After Long COVID-19

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### Abstract

Most people with coronavirus disease 2019 (COVID-19) recover completely within a few weeks. But some people continue to experience symptoms after the initial recovery. This condition is called post-COVID-19 syndrome or long COVID-19. They are threatened by the development of various diseases.

We tried to answer some of these questions in our research. The study was conducted in 49 patients with ophthalmic pathologies who had previously undergone COVID-19. On the one hand, ocular pathologies are important because they allow in a non-traumatic way to obtain lifetime visualization of the state of blood vessels and capillaries as well as to assess the effect of the virus on the central nervous system.

### Keywords

Pupil; Optic Neuritis; Optical Coherence Tomography; Cornea

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## Introduction

The novelty of the study is that we have established a causal relationship between SARS-CoV-2 infecting, formed dysfunction of immune parameters that caused the manifestation of chronic inflammatory diseases [1-5]. As a result, light adaptation was impaired by 2.3 times, due to the damage to blood circulation owing to the neurotoxic effect of SARS-CoV-2 and hypoxemia [6]. The corrective effect of drug Mercureid was fixed in 73.4 % of patients.

The most dramatic cases were observed in the group of patients with damage to the retinal vascular system: the phenomenon of re-thrombosis of both the central retinal vein and its branches, as well as circulatory disorders in the optic nerve trunk - ischemic optic neuropathy with a sharp deterioration in vision [7]. In these patients, the combination of vascular drugs and drug Mercureid allowed stabilizing the patients' state, achieve remission, and in some cases reach high visual functions in 50.0% of cases.

## Materials and Methods

This study is open, according to the declaration of Helsinki Ethical Principles for Medical Research, the Council of Europe Convention on Human Rights and Biomedicine, as well as the relevant laws of Ukraine.

The studies were carried out with the informed consent of the patients who were examined and treated in the Department of Inflammatory Eye Pathology of the State Institution "The Filatov Institute of Eye Diseases and Tissue Therapy of the National Academy of Medical Sciences of Ukraine".

All patients had a history of COVID-19 about 2-3 months before the examination. At the time of treatment and examination, all SARS-CoV-2 IgM antibodies were negative [1-7].

According to the research literature, it is known that cases of venous and arterial thrombosis develop in more than 30% of patients with COVID-19. The most common ones are venous thromboembolic conditions 27% [8,9].

In some patients who underwent COVID-19, a spectrum of changes in the retinal vascular system of the eye was marked. The severity of these changes ranged from changes in the diameter of the retinal vessels, which are often accompanied by para vascular edema, to complete occlusion of the vessel [10].

In our study, out of 9 patients with thrombosis of the central retinal vein and its branches, 4 patients had re-thrombosis of the central retinal vein; the dynamics of visual acuity in this group of patients was negative.

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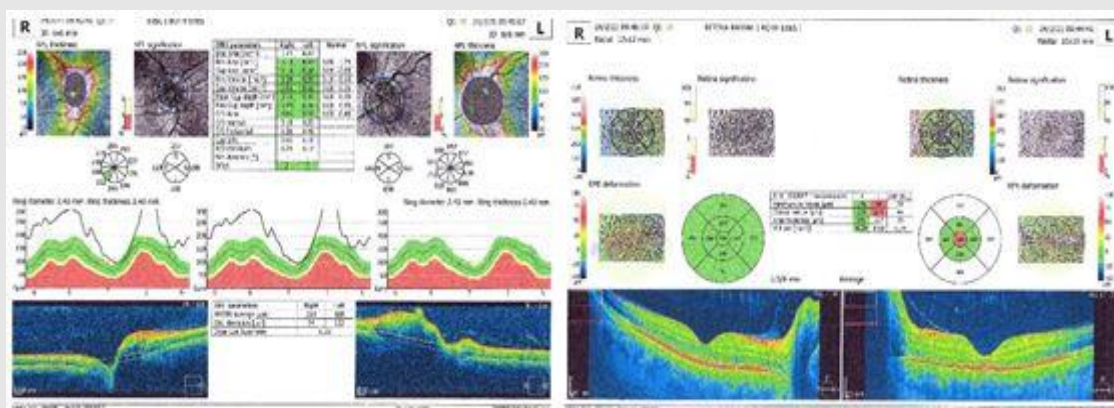
Patients who had eye complications because of long COVID-19, against the background of anti-inflammatory treatment, also received vascular therapy together with taking Mercureid for 1 month. In some patients, one month after the end of the treatment, fundus hemorrhages partially resolved, ischemic edema decreased.

Here are some interesting, in our opinion, clinical cases of the patients.

## Real-life Clinical Cases

Patient A-1, born in 1988 was suffering with COVID-19. On the 3<sup>rd</sup> day after the onset of symptoms of the disease (fever, breathing problems), vision in both eyes decreased was admitted to hospital 14 days after receiving a negative PCR test. Diagnosis at admission: Both eyes: Ischemic neuropathy of the optic nerve. Optic neuritis (vascular). Visual acuity: The right eye 0.6 does not have corrected visual acuity; Left eye: 0.1 does not have corrected visual acuity.

Below is the OCT (Optical Coherence Tomography) state of the right and left eyes (Fig. 1)



**Figure 1:** OCT (Optical Coherence Tomography) state of the right and left eyes.

Right eye the cornea is transparent, spherical. The optic disc is hyperemic, the contours are not clear, ischemic edema and hemorrhages are near the disc, the artery is convoluted, the reflex is blurred in the macular zone (Fig. 2).

Left eye the cornea is transparent, spherical. There are floating opacities in the vitreous body. The optic disc is hyperemic, edema is near the disc, contours are not clear, hemorrhages are near the optic disc, retinal edema is in the macula (Fig. 2). The course of treatment lasted 11 days.

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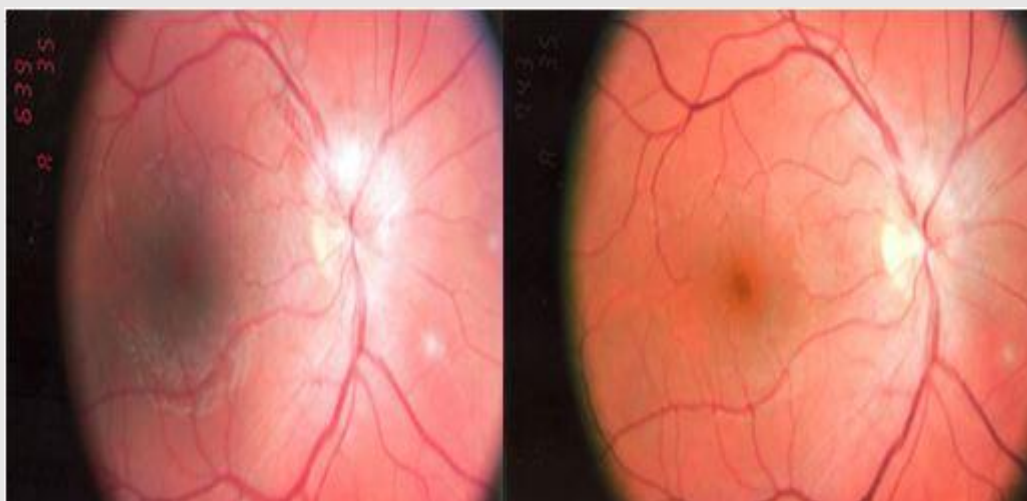
The patient received such treatment: corticosteroids, non-steroidal anti-inflammatory drugs, Mercureid.

## Treatment Results

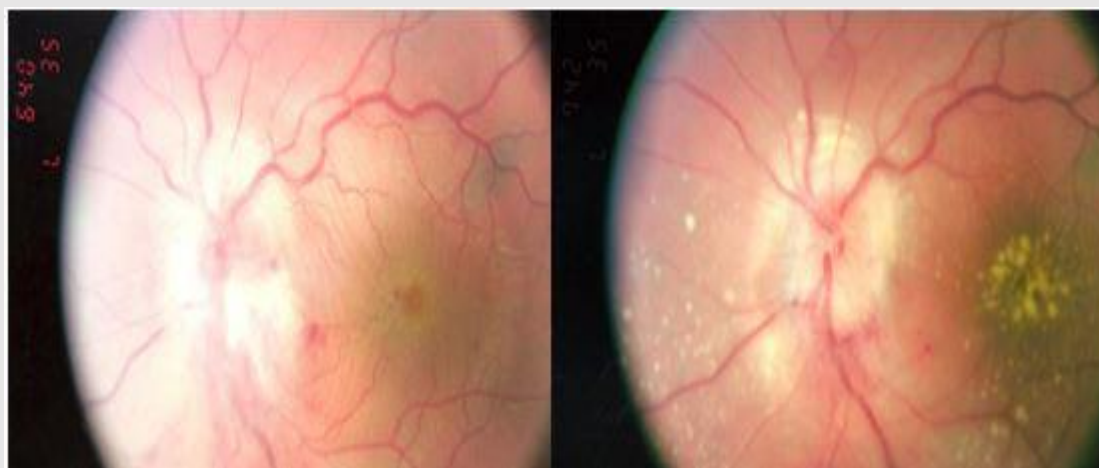
Visual acuity: Right eye 1.0 does not have corrected visual acuity; Left eye: 0.25 does not have corrected visual acuity. After the received treatment: fundus condition:

The right eye has a white sclera, the limbus is not dilated, the cornea is transparent, spherical, the pupil is mobile. The optic disc is hyperemic, but the boundaries have become more distinct, ischemic edema and hemorrhages around the disc partially resolved, the arteries are tortuous, there is a blurred reflex in the macular zone (Fig. 3).

Left eye cornea is transparent, spherical. There are floating opacities in the vitreous body. The optic disc is hyperemic, the edema at the disc decreased, the borders became more distinct, the hemorrhages at the optic nerve head partially resolved, the edema decreased in the macula, and a star figure was formed (Fig. 3). It was recommended to continue therapy.



**Figure 2:** Dynamics of the state of the right fundus of the patient known as Mr. Ch. Before treatment and after treatment.



**Figure 3:** Dynamics of the state of the left fundus of the patient known as Mr. Ch. Before treatment and after treatment.

Patient A-2, born in 1976, was ill with COVID-19. The patient detected a sharp deterioration in vision on the 5<sup>th</sup> day after the temperature had risen. Visual acuity: Right eye: light perception with wrong correction; Left eye: 0.4 does not have corrected visual acuity.

### **The condition of the fundus on admission:**

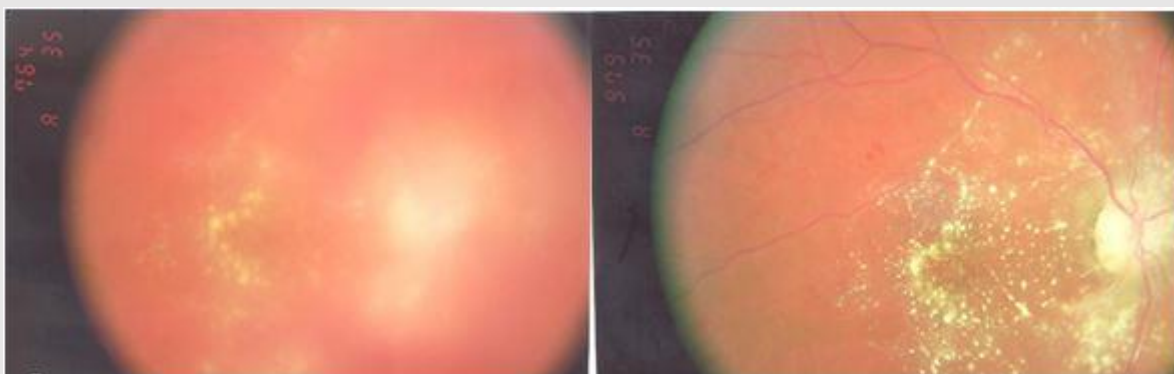
The right eye has a white sclera, the limbus is not dilated, the cornea is transparent, spherical, the pupil is mobile. The optic disc is not visible under a sharp ischemic edema, which spreads to the optic disc and the macular area, arteries are tortuous in the region of the central fossa and paramacular the foci of secondary degeneration are visualized.

Left eye cornea is transparent, spherical. There are floating opacities in the vitreous body. The boundaries of the optic nerve head are not contoured, ischemic edema is at the disc, along the vessels, there are blurred reflexes in the macula area (Fig. 4).

The patient received such treatment: corticosteroids, non-steroidal anti-inflammatory drugs, Mercureid.

According to MRI results, the patient has focal changes in the right frontal lobe (gliosis focus, as a result of viral neuro infection) images in 2 projections (Fig. 5 and 6). On a series of MRI tomograms during a targeted examination, a focus of a gliosis-residual character is registered in the right frontal part, as a consequence of neuro infection.

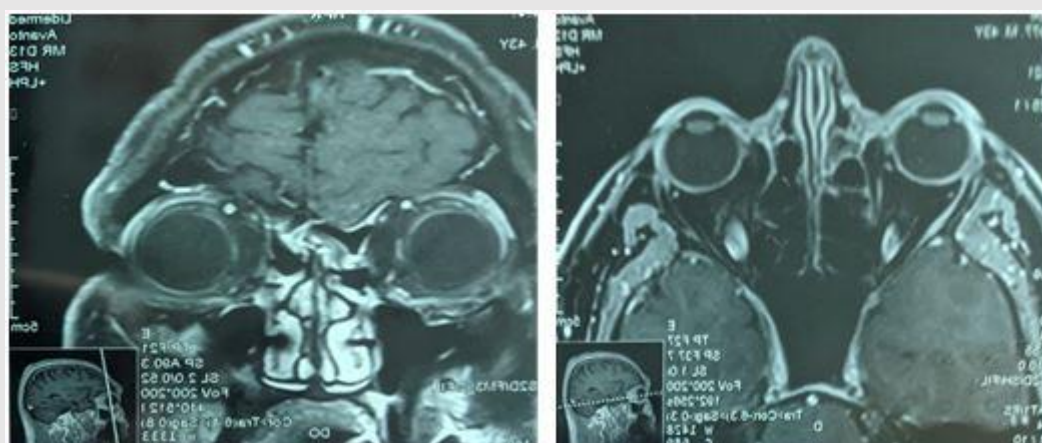




**Figure 4:** Dynamics of the state of the right fundus of the patient known as P. Before treatment and after treatment.



**Figure 5:** Dynamics of the state of the left fundus of the patient known as P. Before treatment and after treatment.



**Figure 6:** Series of MRI tomograms during a targeted examination.

MRI data indicate the presence of acute necrotizing encephalopathy. This complication of viral infection is connected with the development of a cytokine storm, which brings to a violation of the integrity of the blood-brain barrier. In this case, the virus does not penetrate into the structures of the brain that is responsible for the sense of smell.

## Treatment Results

Visual acuity: Right eye 0.01 does not have corrected visual acuity; Left eye: 1.0 does not have corrected visual acuity.

The right eye has a white sclera, the limbus is not dilated, the cornea is transparent, spherical, the pupil is mobile. The optic disc is pale, the edema at the optic disc and in the macular area decreased, foci of secondary degeneration formed in the macular and para macular areas, the arteries are tortuous, narrowed (Fig. 4).

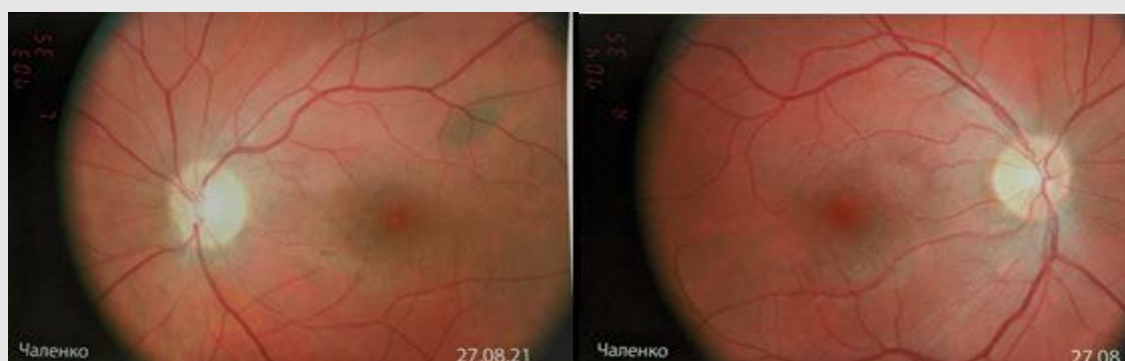
Left eye cornea is transparent, spherical. There are floating opacities in the vitreous body. The optic disc is pale, the ischemic edema in the course of the vessels decreased, the boundaries of the disc became more distinct, the blurred reflex is preserved in the macula area (Fig. 5).

## After Three Months

At the follow-up examination 3 months after the end of the course of treatment with drug Mercureid, the visual acuity in both eyes was 1.0.

Fundus picture in Fig. 7.

Ischemic edema completely resolved. The foci of secondary degeneration were resorbed. The optic disc is paler on the temporal side, the contours are clear [12-14].



**Figure 7:** The picture of the fundus of the patient after 3 months treatment Mercureid drug.

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## Conclusion

The foregoing in this article allows us to conclude the following. COVID-19 can be accompanied not only by visual impairment (with the risk of developing blindness) but also by mental and neurological disorders, including encephalopathy, psychomotor agitation, stroke, meningoencephalitis, impaired smell or taste.

A series of patient observations in France showed that 65% of COVID-19 patients who were located in intensive care units developed signs of confusion (or delirium) and 69% of such patients experienced psychomotor agitation. In the context of COVID-19 disease, delirium correlated with an increased risk of death. In a large number of series of cases from China, the Netherlands, the United States of America and France, the risk of developing acute cerebrovascular accidents (including ischemic and hemorrhagic stroke) was noted.

In two above-mentioned clinical cases, visual impairment was connected with damage to brain structures. In the first case, the structures of rhinencephalon, particularly, the bulbus olfactorius and the tractus olfactorius were damaged. In the second case, there was no damage to the structures of rhinencephalon, the virus did not penetrate there.

Thus, we can state that in each case the neurotropicity of the virus is individually manifested.

Taking these data into account we can conclude that each patient should be examined for changes in the central nervous system, organ of vision, smell and hearing. Concerning the fact that the virus is constantly mutating, the patient's state of immunoreactivity as well as the need for multitarget immunotherapy aimed at eliminating the severe consequences caused by long COVID-19 remain the only common items to all people.

For these purposes, an innovative multi-target immunotherapy drug, namely, Mercureid, has proven its advantages. Its intake during the period of hospitalization, in combination with vascular drugs, made it possible to achieve remission faster, stabilize the patients' state, and achieve higher visual functions (synergism of action).

As a result, lower dosages of drugs used in combination therapy were required (there was less risk of side effects from their use).

After hospital discharge, Mercureid intake as a 3-month monotherapy brought to a complete restoration of vision (it needs reminding that upon inpatient hospital discharge, Right eye 0.01 does not have corrected visual acuity. 3 months later visual acuity became 1.0. Ischemic edema completely resolved. The foci of secondary degeneration were resorbed).



## Conflict of Interests

The authors declare no conflicts of interest.

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