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IMPACT OF THE COVID-19 PANDEMIC UPON THE OPHTHALMOLOGICAL CLINICAL PRACTICE

Ana-Maria Dascalu[1,2], Mihail Silviu Tudosie[1,3], Gabriel Catalin Smarandache[1,4], Dragos Serban[1,4,*]

[1]"Carol Davila" University of Medicine and Pharmacy, Emergency University Hospital - [2]Ophthalmology Department - [3]Clinical Toxicology Department - [4]4th Surgery Department, Bucharest, Romania

Abstract: *Introduction.* With more than 1,000,000 infections around the world, SARS-Cov 2 is responsible for the most severe healthcare crisis in the last 100 years.

Aim. The paper analyzes the impact of COVID 19 pandemic upon the current ophthalmological clinical activity.

Materials and Method. A comparative analyses was carried regarding the clinical activity in March 2019 and March 2020: the number of one day hospitalizations, of continuous hospitalizations, the percentage of emergencies, the number of surgeries, bed turn over, mean hospital stay. The protocols for the health care personnel protection and decontamination were analyzed.

Results. During March 2019, 381 patients were treated in the day hospitalization and 297 patients in the continuous hospitalization regime, with an average length of hospitalization of 3.2 days, and a bed turnover of 6.05. Of these, 76.43% underwent ophthalmic surgery and 14.1% represented ophthalmological emergencies. The comparative analysis shows that in March 2020, the number of one day hospitalizations decreased by 87.4%, and that of the hospitalizations continued with 89.2%. Of the patients admitted, 46.8% were in emergency. Clinical ophthalmological practice has been deeply changed in the context of the COVID 19 pandemic in order to prevent contamination both for patients and medical personnel.

Conclusions. The ocular manifestations associated to SARS-Cov 2 infection are self-limited, but the possibility of infection due to the presence of the virus at the level of the tear secretion is an aspect that we must consider in the ophthalmological clinical practice.

Key words: COVID 19, ophthalmology, clinical activity, infection, Sars-Cov 2.

INTRODUCTION

COVID-19 pandemic began in December 2019 in Wuhan Province, China, managing to cover all continents in less than 4 months, recording more than 1,000,000 infections and over 40,000 deaths so far. The etiologic agent, called SARS-Cov2, is a newly discovered ARN virus in the Coronavirus family, generally responsible for benign respiratory infections, except for the causative agents of MERS (2012) and SARS (2002-2003) outbreaks. In Romania, the first confirmed case was registered on February 26th, 2020. The total number of cases was of 2245 at the end of next month, in the context of the return to the country of a number of over 200,000 Romanian citizens, from the western European countries already badly affected.

The paper aims to analyze the impact of the COVID 19 pandemic on the current clinical activity in the Ophthalmology Clinic of the University Emergency Hospital Bucharest.

MATERIALS AND METHODS

A comparative analysis was carried regarding the monthly clinical activity indicators, before and during COVID 19 pandemic. The data for March 2019 and March 2020 were studied, with regard to the number of one day hospitalizations, the number of continuous hospitalizations, the percentage of emergencies, the number of surgeries, bed turn over, mean hospital stay. The data came from the study of patient records, the surgical protocols, as well as the electronic record of hospital management. Also, the changes regarding the protocols for the health care personnel protection and decontamination were analyzed.

*Correspondence to: Dragos Serban MD, Assistant Professor, "Carol Davila" University of Medicine and Pharmacy, Bucharest, Romania, E-mail: dragos.serban@umfcd.ro

RESULTS

Ophthalmology Department of University Emergency Hospital Bucharest has a total of 40 beds for continuous hospitalization and separate areas for one day hospital stay, where various investigations and ophthalmological procedures are performed.

During March 2019, 1081 patients were treated in the day hospitalization and 387 patients in the continuous hospitalization regime, with an average length of hospitalization of 3.2 days, and a bed turnover of 7.21. Of these, 76.23% underwent ophthalmic surgery and 14.1% represented ophthalmological emergencies. The comparative analysis shows that in March 2020, the number of one day hospitalizations decreased by 67.6%, and that of the hospitalizations continued with 89.2%. Of the patients admitted, 46.8% were in emergency. The comparative data are presented in the Figures 1 and 2.

The average age of the patients admitted for hospitalization in march 2019 (under normal conditions activity) is 57.3 years, with an important percentage of the population over 70 years (32%). The main comorbidities of the hospitalized patients were arterial hypertension and cardiovascular diseases (56,3%) and diabetes (20%), all highlighting a segment of vulnerable population and at risk of developing severe forms of SARS-Cov2 infection.

Changes in the ophthalmological practice in the context of the COVID19 pandemic were the following:

Significant reduction of the scheduled hospitalizations, as the main measure of protection for both patients and healthcare professionals, taking into consideration the increased human density under normal conditions, especially in the area for day hospitalizations;

The clinical activity is focused on solving the ophthalmological emergencies;

Intensification of the disinfection and decontamination measures of the equipment and surfaces, respecting the concentrations and the application times and the use of alcoholic and chlorine solutions, according to the WHO recommendations;

Medical protective equipment with cap, mask, goggles to prevent contamination by aerosols and droplets through conjunctival inoculation, and protective gloves, considering the doctor's contact with the tear / conjunctival secretions and the patient's periocular teguments;

Carefully questioning patients in emergency with acute conjunctivitis about associated fever and respiratory symptoms to exclude a potential SARS-Cov 2 infection and testing suspected cases;

Transparent plastic shields for examination at biomicroscopes, which limits the contact of the ophthalmologist with the patient's droplets and aerosols;

Limit talking with the patient, while examining at the slit-lamp;

Limit the ophthalmoscopy exams in emergency required by other specialties, at the patient's bed, in cases where essential for the diagnosis, given the very close contact that should be established with an incomplete/ non-investigated patient regarding the existence of a respiratory pathology.

DISCUSSION

The COVID 19 pandemic has deeply affected the hospital ophthalmological practice since the first month of presence in our country. The ophthalmological activity in a university clinic, well equipped with the diagnostic and treatment devices, was characterized in the conditions preceding the pandemic by high addressability, high bed turnover, overcrowding of the day hospitalization area. The current legislation of social distancing and of protection of the elderly

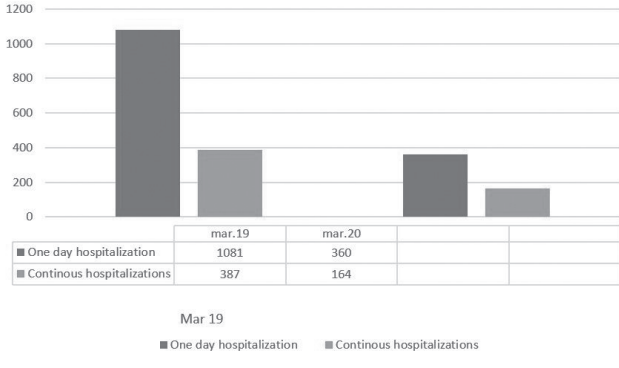

Figure 1. Patients admitted for day hospitalization and continuous hospitalization: comparison between March 2019 and March 2020.

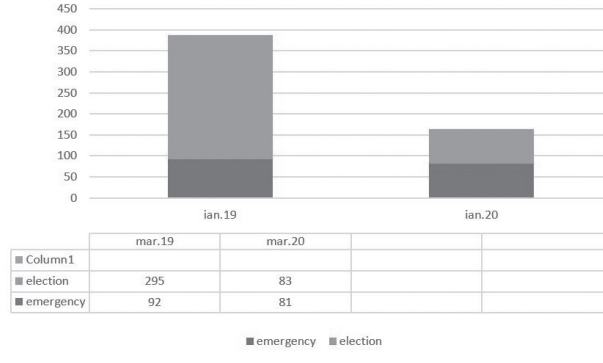

Figure 2. Continuing hospitalizations in emergency and election in March 2019 *vs*. March 2020.

has had a significant impact in the decision to reduce the number of hospitalizations, both by patients' and doctors' decision.

It is known that an ophthalmological examination involves close contact with the patient both during the slit lamp examination, as well as the IOP measurement by applanation tonometry and the examination of the fundus, the ophthalmologists being more exposed to possible contamination than other specialties in cases of infectious respiratory diseases.

Infection modalities confirmed by clinical trials are by droplets, aerosols, direct and indirect contact. The droplets come from the infected persons during sneezing, coughing or talking, of >5 micrometers and high weight, in consequence they follow curved trajectory, and fall on subjects and surfaces at a distance of 1-2 m from the source. When inhaled, they stop at the level of oro-pharynx and start infection in the upper respiratory tract [1, 2].

Aerosols are smaller particles, under 5 micrometers, which can travel with air currents and can be inoculated at the entrance gates (nose, eyes, mouth). Due to their small size, they can reach the broncho-alveolar level directly, along with the inspired air. Situations associated with significant aerosols production are high human density in indoor, closed, spaces and intubation procedures [3]. In particular, in ophthalmology, non-contact tonometry is responsible for generating aerosols from conjunctival secretion, at the moment of impact of the air wave with the ocular surface. There is no clear evidence that the usual means of decontamination are sufficient to prevent the transmission of infection in this context.

Other important means of transmission are direct contact with the hand or skin, mucous secretions of the infected patient or indirect contact by touching the contaminated surfaces by hand, followed by touching the nose, mouth and periocular region. A particular aspect of ophthalmological practice is the use of reusable medical equipment in ophthalmological investigations and treatments: ocular ultrasound probe, prism of applanation tonometry, lenses of gonioscopy or for the laser treatment. Clinical studies reveals that human coronaviruses such as Severe Acute Respiratory Syndrome (SARS) coronavirus, Middle East Respiratory Syndrome (MERS) coronavirus or SARS-Cov 2 can persist on inanimate surfaces like metal, glass or plastic for up to 9 days, but can be efficiently inactivated by surface disinfection procedures with 62-71% ethanol, 0.5% hydrogen peroxide or 0.1% sodium hypochlorite within 1 minute. Other biocidal agents such as 0.05-0.2% benzalkonium chloride or 0.02% chlorhexidine digluconate are less effective and should be avoided [4]. From the current data, SARS-Cov 2 is an RNA beta-coronavirus. Bats are considered the original source of SARS-Cov-2 because a closely related coronavirus, RaTG13, has been isolated from bats [5, 6]. However, the molecular events that led to the possible bat-to-human transmission of SARS-Cov 2 remains still unknown. Coronaviruses contain four structural proteins, including spike (S), envelope (E), membrane (M), and nucleocapsid (N) proteins. The S protein mediates viral entry into host cells by first binding to a host receptor through the receptor-binding domain (RBD) in the S1 subunit and then fusing the viral and host membranes through the S2 subunit. Considering the genomics and structural analyses, it has been reported that SARS-Cov 2 has similar Receptor-binding domain (RBD) as SARS-Cov, which allow it to infect the host via ACE2 Receptors. The difference in aminoacid chain of RBD may look minor, but it is the cause for the different affinity of this binding, explaining the different clinical features and potential of transmission of the 2 coronaviruses in general population [7]. Both viruses are responsible for severe inferior respiratory infections, with fever, cough and interstitial pneumonia, the present SARS-Cov 2 being considered less lethal, but far more contagious than the former SARS-Cov.

The current studies show that compared to the virus that caused the 2002-2003 SARS outbreak, the new coronavirus has evolved new strategies to bind to its human receptor, resulting in tighter binding to the ACE2 receptors [2, 8]. This is how we can explain why, the previous SARS Cov induced only pneumonia, while the current SARS-Cov 2 virus induces also mild common cold symptoms at the upper respiratory tract, in this area, the density of ACE2 receptors being much lower than in pneumocytes [9, 10].

Diarrheal syndrome as the first symptom has been reported in 3-10% of cases, as the virus could also bind ACE2 receptors expressed by enterocytes along the digestive tract [2, 10]. Some studies evidenced the viral presence in patients' stools and the possibility oral-fecal transmission route, the important of disinfection of surfaces and personal hygiene, being again brought into attention.

Another clinical manifestation described is acute viral conjunctivitis, encountered in 1-3% cases. There are no clear evidences about ACE2 receptors presence at the level of conjunctiva, but previous studies showed the importance of RAS system in aqueous humor drainage in eye. [11,12] According to clinical

studies, SARS-Cov 2 associated viral conjunctivitis is self-limiting, with a duration of 3-5 days, associated with moderate fever and +/- respiratory signs. Ophthalmologists questioned about the incidence of viral presence at the level of the tears and conjunctival tissue and the possibility of an ocular transmission of infection.

A well-known case is that of Guanfa Wang, a national expert on pneumonia, who developed a unilateral viral conjunctivitis as a first sign of COVID 19 infection, after visiting a Wuhan hospital. He wore the whole recommended protection equipment, but not goggles. Since his report, healthcare professionals in China have been urged to use eye protection when they are in close contact with patients. Eye protection (goggles) or facial protection (face mask) should be worn, and healthcare workers are advised against touching any mucosal membranes (eyes, nose or mouth) [13-15]. At this time of limited information, we will need to stay highly vigilant to recognize early manifestation of COVID-19 including consideration of viral conjunctivitis as a possible presentation.

Viral identification for diagnosis is made standard by real-time PCR from pharyngeal and nasal exudate. As testing possibilities were under pressure during COVID 19 pandemics, requiring for quick diagnose of respiratory infections, only few RT-PCR from tears were conducted. Several studies, on small groups of patients, performed comparative tests by RT-PCR to isolate the virus in tears and nasal / pharyngeal exudate in hospitalized patients for interstitial pneumonia. The results showed that: all patients with conjunctivitis were positive in RT-PCR testing of tears for SARS-Cov 2 and a variable percentage of patients without ocular symptoms, between 0 and 5%, presented the virus in tears and conjunctival scraping, consequently it could transmit the infection through contact with the conjunctival mucosa, even in the absence of clinical ophthalmological manifestations [16-19]. However, these studies have some limitations, which is why their results cannot be extrapolated to the general population: the small number of cases studied (between 30 and 68), the fact that patients were already on antiviral treatment at the time of presenting the samples, the possibility that not enough material has been collected for viral identification in tears in some cases.

The anatomical approach, the communication via the tear-nasal canal and a structure with numerous similarities of the conjunctival mucosa with the respiratory one, support the hypothesis of the infection with the ocular entrance gate. Ophthalmologists should take particular care when examining patients, because of both the proximity to patients' nose and mouth, and the potential exposure to tears which may contain the virus.

In conclusion, the ocular manifestations of SARS-Cov 2 infection do not pose particular treatment problems, being self-limiting and healing spontaneously. But the possibility of infection due to the presence of the virus at the level of the tear secretion is an aspect that we must consider in the ophthalmological clinical practice. Considering this, the protocol has been modified to prevent the infection of the medical personnel and of the transmission of the infection between patients. Healthcare professionals should take the full recommended measures including strict hand hygiene and protecting the exposed mucous membranes, including wearing goggles or face masks [17].

The COVID 19 pandemic has made the medical staff engaged in ophthalmological practice aware of the mechanisms of transmission of ocular and respiratory infections and, most likely, will modify long-term protocols of good practice in specialized clinics.

Conflict of interest

The authors declare that they have no conflict of interest.

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