



Is the role of forensic medicine in the covid-19 pandemic underestimated?

Milenko Bogdanović¹ · Tatjana Atanasijević¹ · Vesna Popović¹ · Zoran Mihailović¹ · Bojana Radnić¹ · Tijana Durmić¹

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Abstract

We believe that forensic medicine should play a significant role in the COVID-19 pandemic. Forensic pathologists should ask and answer various questions through autopsy cases during the COVID-19 period, thus providing a significant contribution to science. Some of the potential roles of forensic medicine in this issue include: determining the exact cause of death among the deceased who were SARS-CoV-2 positive, contribution to the accuracy of mortality statistics, understanding pathological mechanisms of COVID-19, tracking the presence of the virus over time, survival of the virus after death as well as dealing with medicolegal issues. A detailed multidisciplinary analysis of autopsy samples would undoubtedly help understand this new illness and its clinical management. Therefore, autopsies during the COVID-19 pandemic should not be an exception, but certainly a rule.

Keywords COVID-19 pandemic · SARS-CoV-2 · Forensics · Autopsy · Mortality statistics · Cause of death

Since December 31st, 2019, when several cases of pneumonia of unknown etiology were formally recognized in Wuhan City, China and the rest of the world have been facing a new public health challenge. The causative agent, identified from throat swab samples on January 7th, 2020, was named Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) [1, 2]. Moreover, the World Health Organization named the disease COVID-19 [1]. The burden of this new disease has been a cause of major concern for the whole world, especially for countries with vulnerable healthcare systems. On March 6th, 3 months after it was first identified, the first case of COVID-19 infection was officially registered in Serbia. Since then, in the last 3 months, there have been over 12,000 cases, with over 250 deaths defined as COVID-19-related. The Government of the Republic of Serbia formed a Crisis Response Team to diminish the emergence of the new infectious disease and to prevent its possible harmful

consequences on the population. The leading measures to combat this growing global problem have been implemented through isolation and quarantine of those at risk. They have slowed the spread of the epidemic and prevented the “break-down” of the healthcare system.

According to a recent scientific guide, in Serbia, as well as in many other countries, the lack of ‘safe’ autopsy rooms (equipped for preventing SARS-CoV-2 transmission) has been a great problem. Therefore, no autopsies (clinical or medicolegal) of proven COVID-19 cases have been performed during the pandemic in Belgrade. This has led to a reduction in the number of autopsies performed in the Institute of Forensic Medicine in Belgrade in the last 3 months of almost 30% [3]. Compared to the number of autopsies performed in northern Italy in the same period, this cannot be considered a dramatic decrease. The pathologists at the Institute of Forensic Medicine in Belgrade took nasopharyngeal swabs from all of the deceased immediately after admission of the bodies and before autopsy. Thus, a negative result of RT-qPCR analysis was established as an inclusion criterion for a full postmortem examination. The Belgrade region was the most affected part of Serbia in this pandemic, probably due to the fact that although it only covers 3% of the entire country’s surface area, almost one-third of the Serbian population lives there.

✉ Milenko Bogdanović
drbogdanovicm@gmail.com

¹ Institute of Forensic Medicine “Milovan Milovanović”, University of Belgrade - School of Medicine, 31a Deligradska str, Belgrade 11000, Serbia

We selected a few cases suspected of COVID-19 based on macroscopic findings and heteroanamnesic data despite them returning a negative result on RT-qPCR analysis. After performing histological examination and additional postmortem diagnostics (toxicological, serological, and microbiological tests), we concluded that the cause of death in these cases was probably COVID-19. This calls into question the reliability of the postmortem RT-qPCR analysis, even though nasopharyngeal swabs proved to be useful as a preliminary test to obtain additional data about a possible COVID-19 infection.

We think that forensic medicine should play a significant role in the COVID-19 pandemic. We have only found one forensic study and a few autopsy reports in the literature describing cases of COVID-19 [4–7]. Forensic pathologists should ask and answer various questions through autopsy cases during the COVID-19 period, thus providing a significant contribution to science [8, 9]. Therefore, we will mention and explain some of the potential contributions forensic medicine may be able to make to understanding and controlling this pandemic.

Determining the exact cause of death among SARS-CoV-2 positive decedents

It is impossible to determine the exact cause of death among the SARS-CoV-2 positive patients without a postmortem investigation. After performing comprehensive diagnostics, it would be possible to classify the deceased into two categories: “death caused by COVID-19” and “death with COVID-19”. It is also important to emphasize that a clear differentiation between these categories would help clarify the administrative shortcomings related to keeping mortality data on the main cause of death. Additionally, a comprehensive postmortem examination would provide the opportunity to assess the contribution of existing comorbidities (e.g. cardiovascular, malignant, respiratory, metabolic, etc.) and habits of the deceased to the death outcome among SARS-CoV-2 positive patients.

Contribution to the accuracy of mortality statistics

The effects of the COVID-19 pandemic on the overall population mortality is still unknown. The published data on population mortality from COVID-19 in other countries are still scarce, incomplete and largely based on deaths among infected people, most of whom already had underlying health conditions [10]. This could lead to an overestimation of the COVID-19 fatality rate because there is no estimation of the degree (rate or magnitude of the effect) to

which an underlying disease predisposes a person to a worse outcome. On the other hand, using the statistical data on excess deaths during the pandemic could also easily lead to an overestimation of the fatality rate, because the COVID-19 pandemic may have reduced the capabilities of healthcare systems to properly respond to other medical situations. Consequently, the case definition criteria for testing could have meant some of the COVID-19 patients were undiagnosed, resulting in the opposite, underestimated effect on the fatality rate. In the absence of reliable data on the prevalence of the infection in many countries, the suggested numbers of infected asymptomatic people vary greatly.

Understanding pathological mechanisms of COVID-19

Postmortem examination offers an insight into pathophysiology and provides greater accuracy in cause-of-death reporting, thus enabling the collection of tissue for more sophisticated analyses, such as immunohistochemical, serological, microbiological, and genetic analyses. For example, in past autopsy studies on SARS, the cases were particularly important for understanding and defining the pathological mechanisms [11, 12]. According to literature, coronaviruses are not always restricted to the respiratory tract, but can also affect other organs (e.g. heart, brain, kidneys, etc.). Furthermore, the latest literature also indicates that COVID-19 could be associated with sudden death [7, 13, 14]. Therefore, autopsies on people who suffered from COVID-19 and died after hospital discharge could provide a better insight into potential post-viral sequelae.

Tracking the presence of the virus over time

The role of forensic medicine could be to determine the date of the first occurrence of SARS-CoV-2 in a population in forensic practice (based on seropositivity and/or nucleic acid testing). Testing the autopsy material on SARS-CoV-2 would also lead to better tracking of the presence of the virus in population for the whole duration of the epidemic. This was also perceived as very important in other epidemics [15].

Survival of the virus after death

The clarification of the issue of survival of the virus after death and the possibility of its detection in different body samples (blood, urine, vitreous humor, cerebrospinal fluid, as well as different tissue samples) are also of great importance. How long, or to what extent, the virus can remain active in a human

cadaver is currently unknown. Determining this is very important for the estimation of the potential risk of transmission to medical staff in autopsy rooms.

Medicolegal issues

Crisis situations, such as this pandemic, are accompanied by different medicolegal issues. The lack of police investigations and a reduced number of full postmortem examinations could potentially conceal cases of criminal offenses. Thus, the link between some types of violent deaths (e.g. suicides, domestic violence, etc.) and COVID-19 should be estimated. Finally, the unavailability of healthcare services, accompanied by a lack of autopsies in the past few months, could also raise the issue of medical malpractice.

COVID-19 is a global problem, and a topic that has been preoccupying the scientific community for months. It is our opinion that forensic associations in every country should receive support in the form of autopsy rooms that are adequately equipped for safe postmortems of the deceased infected with SARS-CoV-2. A detailed multidisciplinary analysis of autopsy samples would undoubtedly help understand this new illness and its clinical management. Therefore, autopsies during the COVID-19 pandemic should be a rule rather than an exception.

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Compliance with ethical standards

Conflict of interest The authors hereby declare that they have no conflict of interest.

Ethical approval This article does not contain any studies with human participants or animals performed by any of the authors.

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