Dermatopathology practice in the era of COVID-19

Heba A. Abdelkader

Received: 15 September 2020 / Revised: 15 November 2020 / Accepted: 19 December 2020 / Published online: 9 February 2021

© The Author(s), under exclusive licence to Springer-Verlag GmbH, DE part of Springer Nature 2021

Abstract

Coronavirus disease 2019 (COVID-19) pandemic has affected almost all aspects of our life including health care services. A lot of dermatopathology laboratories have stopped working during this pandemic. This article aims at reviewing the challenges and effects of COVID-19 on the practice of dermatopathology in view of the current guidelines.

Keywords COVID-19 · Dermatology · Laboratories · Coronavirus disease · Biosafety

Introduction

Dermatopathologists work in collaboration with dermatologists and dermatologic surgeons. Sometimes it is difficult to reach a diagnosis on clinical grounds alone, and it becomes necessary to take a biopsy for histopathological examination. Some cases require additional studies such as immunofluorescence, immunohistochemical, histochemical, ultrastructural, microbiological, and molecular studies.

Coronavirus disease 2019 (COVID-19) has emerged in December 2019 in Wuhan, Hubei province, China. It is an acute disease caused by a novel coronavirus called Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) which is a positive-sense enveloped single-stranded RNA virus [1]. The mode of transmission is mainly through droplet inhalation or by touching droplet-contaminated surfaces then touching the eyes, nose, or mouth. Other modes of transmission are being revealed such as fecal–oral transmission [2]. The viral RNA has been also detected in blood, serum [3], saliva [4], and tears [5] of patients. However, the infectivity of the different body fluids carrying the novel coronavirus is still unknown. Thus, precautions should be fully considered during the handling of skin and mucous-membrane biopsies to avoid contact with potentially infectious tissue fluids.

Discussion

Preparedness of the laboratory

A dermatopathology laboratory should be adequately prepared to deal with COVID-19 confirmed/suspected patients or potentially infective asymptomatic cases. It is advisable to set up waiting rooms that allow a distance of at least 6 ft between patients. A separate waiting area for suspected cases should be prepared. It is preferable to screen patients at a triage station before entering into the laboratory to limit potential infection. Hand sanitizers and wipes should be available in the waiting room, exam room, bathroom, and reception area. Laboratory workers should wear appropriate personal protective equipment (PPE) when screening patients at the triage station. They should provide masks to all patients presenting with flu-like symptoms or reporting possible COVID-19 infection. If possible, those patients should be given another appointment for biopsy taking after the resolution of symptoms. Telehealth services can be used to determine the priority for biopsy taking, reschedule patients with respiratory symptoms or less urgent conditions irrespective of their symptom or exposure status, limit the number of personnel attending the laboratory with the patient to only those people who are necessary. Laboratory staff should regularly monitor themselves for signs of infection and undergo home isolation if COVID-19 infection is suspected or confirmed. In addition, there should be a record of the laboratory staff who were exposed to a person under investigation (PUI) if testing results are pending. Work restrictions recommended by the public health guidance should be applied if the patient...
proved to be COVID-19 positive or the testing results are delayed more than 72 h [6–8].

Precautions during biopsy taking and specimen handling

The guidelines of the World Health Organization (WHO) recommend considering all specimens as potentially infectious [7]. Standard precautions of WHO for medical procedures should be applied during biopsy taking to ensure safety and reduce the risk of infection. These precautions should be applied for all patients and they include hand hygiene (by soap-and-water hand washing or the use of an alcohol-based hand rub) and the use of PPE to avoid contact with patients’ blood and body fluids. In addition, it is advisable to avoid sharps injury and consider safe waste management, disinfection, and sterilization of equipment [9]. In case of dealing with patients with probable or confirmed COVID-19 infection, laboratory staff should wear a medical mask, eye protection (goggles or a face shield), long-sleeved gown, and gloves and they should perform hand hygiene measures before and after contact with the patient and his surroundings, and immediately after removal of PPE. Incomplete application of these measures poses high risk to the laboratory staff and calls for application of work restrictions recommended by the public health guidance [7, 8]. In case of taking a biopsy from the oral mucosa, it is recommended to let the patient perform mouth wash and gargle with an antimicrobial mouthwash such as 0.5–1% hydrogen peroxide, 0.2% povidone–iodine, chlorhexidine gluconate, or cetlypyridinium chloride to reduce the coronavirus load in saliva [9]. All specimens should be associated with adequate clinical information and clear labeling especially if COVID-19 positive/suspicious. Paperless electronic request forms are preferred since the virus can persist on papers for at least 24 h [10].

Fortunately, the routine histopathological preparation process often inactivates many viruses such as the Ebola virus [11]. Chemicals used during processing such as ethanol (78–95%), glutaraldehyde (0.5–2.5%) and formaldehyde (0.7–1%) significantly decrease coronavirus infectivity [12]. Formalin and glutaraldehyde were found to inactivate SARS-CoV in a temperature- and time-dependent manner. At 37 °C or room temperature, formalin inactivated most but not all viruses on day 1, while glutaraldehyde completely inactivated the SARS-CoV by day 2 at 25 °C and by day 1 at 37 °C [13]. A concentration of 0.5–2% formaldehyde is effective in inactivating SARS-CoV-2 after 1 h at room temperature [14]. Moreover, heating at 60, 80 and 100 °C was found to inactivate SARS-CoV and SARS-CoV-2 in 32.5, 3.7 and 0.5 min, respectively [15]. Most laboratories apply a protocol of formalin tissue fixation for 48 h at room temperature and paraffin infiltration at 60–65 °C for 2 h or more [16]. Thus, formalin-fixed paraffin-embedded blocks are suggested to carry a low risk of SARS-CoV-2 infectivity. Conversely, unfixed specimens (e.g., frozen sections, specimens for direct immunofluorescence (DIF) and formalin-free-vacuum-collected specimens) and partially fixed specimens (e.g., specimens that are incompletely immersed in formalin or immersed for a short period) are considered to be potentially infectious and are better avoided. If necessary, laboratories should adhere to the biosafety guidelines while handling such specimens. Aerosol-generating procedures such as frozen section and DIF preparation should be performed in a biological safety cabinet. If not feasible, the additional precautions recommended by the WHO should be applied [9] as shown in Table 1.

Disinfection of the laboratory

Similar to other coronaviruses, SARS-CoV-2 can persist on surfaces for extended periods [17]. Therefore, it is of high importance to disinfect all work surfaces to avoid transmission of infection. This should include all high-touch surfaces in the laboratory such as countertops, chairs, buttons, handles, beds, and tables. Several disinfectants were reported to be effective such as 0.1% sodium hypochlorite, 62–71% ethanol, and 0.5% hydrogen peroxide [12]. The WHO recommends the use of sodium hypochlorite 0.5% for disinfecting large surfaces and ethanol 70% for reusable equipment and small surfaces (e.g., glass slides) [7].
Teledermatopathology

Teledermatopathology represents the application of modern communication services for the diagnosis of skin diseases at distant locations. This can be accomplished by two forms: the dynamic remote manipulation of a robotic microscope or the static store-and-forward transmission of a single file. The static option is fast and easy to use but has the disadvantage of misdiagnosis due to field selection errors. Virtual microscope teledermatopathology has been introduced recently. It involves the transmission of high-resolution images that can be viewed at any site on any computer [19]. The digitization of slides at high resolution and their electronic transfer maintains the biosafety and avoids the potential risk of transmission of infection. With this technology, the dermatopathologists can do their work without the need to travel to remote sites. It also offers a good opportunity for teleconsultation and tele-education during difficult situations like this pandemic.

In conclusion, the COVID-19 pandemic has posed new challenges to the face of the practice of dermatopathology. It is necessary for dermatopathologists to continuously update their knowledge about the novel virus and its pathophysiology. In addition, they should develop new strategies to benefit from modern technology like teledermatopathology.

Funding None.

Data availability Not applicable.

Compliance with ethical standards

Conflict of interest None declared.

References

1. Gorbalenya AE, Baker SC, Baric RS, de Groot RJ, Drosten C, Gulyaeva AA et al (2020) The species severe acute respiratory syndrome-related coronavirus: classifying 2019-nCoV and naming it SARS-CoV-2. Nat Microbiol 5:536–544
2. European Centre for Disease Prevention and Control (2020) Factsheet for health professionals on Coronavirus 2019. https://www.ecdc.europa.eu/en/factsheet-health-professionals-coronaviruses. Accessed 1 Aug 2020
3. Chang L, Yan Y, Wang L (2020) Coronavirus disease 2019: coronaviruses and blood safety. Transfus Med Rev 34(2):75–80
4. To KK, Tsang OT, Chik-Yan Yip C, Chan KH, Wu TC, Chan JMC et al (2020) Consistent detection of 2019 novel coronavirus in saliva. Clin Infect Dis 71(15):841–843
5. 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 92(6):589–594
6. CDC Steps to prepare healthcare facilities (2020) https://www.cdc.gov/coronavirus/2019-ncov/healthcare-facilities/steps-to-prepare.html. Accessed 1 Aug 2020
7. WHO guides on preventing the spread of COVID-19 in your practice/facility (2020) https://iris.wpro.who.int/bitstream/handle/10665.1/14482/COVID-19-022020.pdf. Accessed 1 Aug 2020
8. Interim U.S. Guidance for Risk Assessment and Work Restrictions for Healthcare Personnel with Potential Exposure to COVID-19 (2020) https://www.cdc.gov/coronavirus/2019-ncov/hcp/guidance-risk-assessment-hcp.html. Accessed 13 Nov 2020
9. Infection prevention and control during health care when novel coronavirus (nCoV) infection is suspected, Interim guidance, 25 January 2020. https://www.who.int/publications-detail/infection-prevention-and-control-during-health-care-when-novel-coronavirus-(ncov)-infection-is-suspected-20200125. Accessed 1 Aug 2020
10. Vergara-Buenaventura A, Castro-Ruiz C (2020) Use of mouthwashes against COVID-19 in dentistry. Br J Maxillofacial Surg 58(8):924–927
11. Barbareschi M, Ascoli V, Bonoldi E, Cavazza A, Colombari R, Cozzi I et al (2020) Biosafety in surgical pathology in the era of SARS-CoV2 pandemia. A statement of the Italian Society of Surgical Pathology and Cytology. Pathologica 112(2):59–63
12. Henwood AF (2018) Ebola and histotechnologists. J Histotechnology 41(2):71–73
13. Kampf G, Todt D, Pfaender S, Steinmann E (2020) Persistence of coronaviruses on inanimate surfaces and their inactivation with biocidal agents. J Hosp Infect 104(3):246–251
14. Darnell ME, Subbarao K, Feinstone SM et al (2004) Inactivation of the coronavirus that induces severe acute respiratory syndrome. SARS-CoV J Virol Methods 121(1):85–91
15. Jureka AS, Silvas JA, Basler CF (2020) Propagation, inactivation, and safety testing of SARS-CoV-2. Viruses 12(6):622
16. Hessling M, Hoenes K, Lingenfelder C (2020) Selection of parameters for thermal coronavirus inactivation—a data-based recommendation. GMS Hyg Infect Control 15:Doc16
17. Paraffin Processing of Tissue 2016 (2020) https://www.protocolsonline.com/histology/sample-preparation/paraffin-processing-of-tissue/. Accessed 1 Aug 2020
18. van Doremalen N, Bushmaker T, Morris DH, Holbrook MG, Gamble A, Williamson BN et al (2020) Aerosol and surface stability of SARS-CoV-2 as compared with SARS-321 CoV-1. N Engl J Med 382(16):1564–1567
19. Massone C, Brunasso AMG, Campbell TM, Soyer HP (2008) State of the art of teledermatopathology. Am J Dermatopathol 30:446–450

Publisher’s Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.