Journal of
Transcatheter Interventions
e-ISSN e-2595-4350

Update on SBHCI positioning about COVID-19 pandemic

Atualização do posicionamento da SBHCI sobre a pandemia de COVID-19

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DOI: 10.31160/JOTCI202028A202004

ABSTRACT – Aware of the new evidence and lessons on progress of the novel coronavirus pandemic (COVID-19) in Brazil and all over the world, and of its impact in the routine of Interventional Cardiology, we have updated the positioning of the *Sociedade Brasileira de Hemodinâmica e Cardiologia Intervencionista* to reinforce the practical orientations and detail some specific aspects related to protection of healthcare workers and indication of procedures in the cath lab.

Keywords: Pandemics; Coronavirus infections; Health personnel; Security measures

RESUMO – Atentos às novas evidências e lições relacionadas à evolução da pandemia do novo coronavírus tipo 2 (COVID-19) no Brasil e no mundo, e a seu impacto na rotina da Cardiologia Intervencionista, atualizamos o posicionamento da Sociedade Brasileira de Hemodinâmica e Cardiologia Intervencionista para reforçar orientações práticas e detalhar aspectos específicos relativos à proteção dos profissionais de saúde e à indicação de procedimentos no laboratório de hemodinâmica.

Descritores: Pandemias; Infecções por coronavírus; Pessoal de saúde; Medidas de proteção

THE PANDEMIC IN BRAZIL AND ITS CONSEQUENT EFFECTS ON INTERVENTIONAL CARDIOLOGY

The pandemic of the novel coronavirus - severe acute respiratory syndrome coronavirus 2 or SARS-CoV-2, known by the acronym COVID-19, has already reached all Brazilian states. In many of them, it is in the phase of community dissemination and rapid acceleration.[1] Most infected patients have mild flu-like symptoms, but there is an increasing number of hospitalizations and deaths and, in some states, there is a risk of patient overload within the health care system.[2] So far, there is no vaccine or validated specific treatment.[3] Personal hygiene, protection of vulnerable groups and social distancing, in addition to strict social isolation measures have been adopted to reduce the speed of dissemination, "diluting" the demand for intensive care support. At the same time, administrative efforts have been made to provide diagnostic tests, meet the huge demand for personal protective equipment (PPEs), and expand the number of intensive care beds with mechanical ventilation throughout the country.

The consequent effects of the pandemic on the cath lab are evident and are linked to the expressive reduction in elective procedures, the risk of underdiagnosis of coronary heart disease due to difficulty in accessing the health care system or fear of seeking care, the potential cardiological manifestations of the virus and, fundamentally, adjustments in laboratory workflows to protect healthcare workers and patients.

PROTECTION OF HEALTHCARE WORKERS AND PARTICULARITIES OF THE CATH LAB

Healthcare workers have a high occupational risk of contamination, in addition to a high potential to spread the disease. It is necessary to protect them, diagnose and keep away suspected or affected cases, in addition to reincorporating those who recovered

How to cite this article:
Falcão BA, Botelho RV, Sarmento-Leite RE, Costa RA. Update on SBHCI positioning about COVID-19 pandemic. J Transcat Interven. 2020;28:eA202004. https://doi.org/10.31160/JOTCI202028A202004

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Received on:
Apr 8, 2020

Accepted on:
Apr 14, 2020

safely. Understanding the transmission characteristics of the virus and the ability to identify suspected cases and interpret diagnostic tests are essential in this process.

Virus transmission characteristics

Viral transmission occurs from human to human, via respiratory droplets and, potentially, via aerosols or contact with contaminated surfaces.[4] Evidence suggests that the virus remains viable in aerosol form for up to 3 hours, and on some contact surfaces for up to 3 days.[5] Asymptomatic or pre-symptomatic infected individuals can act as vectors of the disease.[6] In preventive strategies, it should also be considered that, in addition to colonizing the airways, viral RNA was detected in blood, urine and stool samples of infected patients, and the incubation period varies from 1 to 14 days.[7,8]

Clinical suspicion and diagnostic tests

The diagnosis of COVID-19 is suspected based on clinical manifestations and epidemiological factors, and it is confirmed by laboratory tests. The definition of a suspected case, according to the Ministry of Health, comprises influenza-like illness and severe acute respiratory syndrome.[9] To confirm diagnosis, reverse transcription polymerase chain reaction (RT-PCR), a molecular biology test is used, which detects the RNA of the SARS-CoV-2 virus in samples ideally collected within 7 days of onset of symptoms, or immunological tests (rapid test or classic serological methods) to detect IgM and/or IgG antibodies to SARS-CoV-2, in a sample collected after the seventh day of the symptom onset.[10,11] Negative diagnostic tests in patients with high clinical suspicion should be interpreted with caution, since their negative predictive value may be limited.[12] Diagnostic confirmation can also be made by clinical-epidemiological criteria in suspected cases, who had recent close contact with a laboratory-confirmed case.[9]

Healthcare professionals should be kept away due to high-risk occupational exposure, clinical suspicion or laboratory confirmation for COVID-19. The duration of leave is at least 14 days and must be guided individually.[9] Criteria for terminating isolation vary among countries, but all include the clinical resolution of symptoms and the clearing of viral RNA in the upper airways, verified in at least two samples with an interval greater than 24 hours.[13] Immunological tests for detection of IgG antibodies to SARS-CoV-2 could, in theory, identify immunized individuals. Once validated for that purpose, they would be of great value to guide the reincorporation and management of healthcare workers.[14]

Recommended general protective measures

The following structural, administrative and PPE-related measures are recommended, respecting local characteristics, the policies of the Hospital Infection Control Commission of each organization, and the guidelines of health authorities:

- Define clear protocols to protect healthcare workers and patients, respecting local specificities.
- Identify a room in the cath lab to be dedicated to patients with confirmed or suspected COVID-19, which ideally has a negative pressure system.
- Establish the patient's admission flow, the room staff who will provide care (with as few members as possible), and the patient's transport flow back to the inpatient unit.
- Perform daily check of equipment and materials.
- Reduce the number of people in the laboratory and organize fixed teams by shifts, to prevent possible simultaneous contamination of multiple professionals in the department.
- Emphasize hand washing, respiratory hygiene, surface cleaning and social distancing within the sector.
- Make PPEs available and instruct healthcare professionals on their indications, guidelines for dressing, use and removal, as well as disposal and disinfection procedures.
- Provide alternatives to enable the isolation of the healthcare professionals from their own family members.
- Prioritize diagnostic tests to detect and isolate (quarantine) infected health professionals, and safely re-incorporate those who recovered.

Specificities of personal protective equipment in the cath lab

There is a high risk of PPE shortage in the context of the pandemic, and it is essential to use them rationally.[15] In the cath lab, there are some particularities that must be considered:

- Uncertainty regarding the patient's diagnosis of COVID-19, in emergency settings.
- Potential for exposure to aerosols due to orotracheal intubation or unforeseen cardiopulmonary resuscitation maneuvers.
- Risk of contamination of operators' legs and feet by organic material splashes.
- Slowness in the donning and doffing process, due to the need to reconcile anti-infectious protection, radiological protection and sterile field maintenance.

Standard protection in the cath lab should include surgical mask, gloves, aprons (waterproof, disposable and sterile), hair protectors (caps) and shoe protectors (or sanitized closed shoes). In aerosol-generating scenarios, it is necessary to add face shield, or goggles, and replace the surgical mask with an N95, FFT2 or FFT3 mask, without valves and well-adjusted to the face. In situations of greater risk of exposure, enhanced protection is suggested, which includes, in addition to protection for aerosols, two gloves and cleanable leg protectors or boots.

For procedures in patients with no suspicion of COVID-19, it is suggested to adopt standard protection for the entire

team, considering enhanced protection for operators and anesthesiologists in places with community transmission of the disease, or for the entire team, if aerosol-generating procedures are performed. For procedures on patients with suspected or confirmed COVID-19, enhanced protection is recommended for the entire team. Both donning and doffing must follow a supervised routine with registration and monitoring of the professional in case of possible exposure. There is a video publication that illustrates the steps of these processes.[16]

INDICATION OF PROCEDURES IN INTERVENTIONAL CARDIOLOGY

The indication of hemodynamic procedures in the context of the pandemic requires analysis of the following aspects, supported by the ethical principles of non-maleficence, beneficence and justice:

- Cardiovascular and infectious risk-benefit ratio of the procedure for the patient.
- Protection of healthcare workers and patients against the risk of spreading the infection.
- Priority allocation of resources, such as beds, equipment, supplies and personnel.[17]

Some important data must be considered:

- Cardiovascular disease patients are a more vulnerable group for COVID-19 and have a worse prognosis when affected by the infection.
- Cardiac manifestations, such as acute myocardial injury, arrhythmias and heart failure decompensation have been described.[18] The angiotensin-converting enzyme (ACE) 2 receptor, expressed on the cardiomyocyte membrane, acts as a binding site through which the virus is internalized into the cell.
- Elevation of troponin in patients infected with COVID-19 is a marker of poor prognosis and occurs with high frequency in the most severe cases. At least four mechanisms may be involved: acute cardiac injury by the virus (myocarditis); hypoxemia with secondary ischemia (myocardial infarction type 2); microvascular damage (spasm and prothrombotic potential); and systemic inflammatory response with release of cytokines and rupture of atherosclerotic plaques (myocardial infarction type 1).[18]
- Delays in performing primary percutaneous coronary intervention have been reported and attributed to the screening process and the necessary anti-infectious protection barriers during the pandemic.[19]

Specific guidelines, according to the status or diagnostic probability of COVID-19 in the patient, considering an elective, urgent or emergency clinical scenario, are outlined below.

Elective procedures

Elective scenarios include percutaneous coronary interventions in patients with chronic coronary artery disease, preoperative evaluations for elective procedures, closure of patent foramen ovale or interatrial communication, among other structural procedures in stable patients, for example.

In patients with no suspicion of COVID-19 or with negative tests, consider postponing elective procedures, according to the individualized assessment of the cardiovascular and infectious risk-benefit ratio, respecting the structure and local epidemiological conditions. If you decide to perform the procedure, do it, if possible, in a "clean" cath lab for non COVID-19 patients, adopting protective measures consistent with the local epidemiological reality.

For diagnosed or suspected COVID-19 patients, postpone elective procedures until the patient is completely recovered and in a non-infective stage.

Urgent procedures

Urgent scenarios include clinically "stabilized" patients with non-ST segment elevation acute coronary syndrome; patients undergoing fibrinolysis with reperfusion criteria in the context of an ST-segment elevation myocardial infarction; patients with symptomatic aortic stenosis, requiring hospitalization, preoperative evaluation of urgent procedures, among others.

In patients with no suspicion of COVID-19 or with negative tests, perform the procedure, if possible, in a "clean" cath lab for non COVID-19 patients, adopting protective measures consistent with the local epidemiological reality.

For suspected COVID-19 patients, postpone the procedure, maintaining clinical treatment and monitoring, with isolation in a single room, until the diagnostic definition of COVID-19.

For confirmed COVID-19 patients, postpone the procedure, maintaining clinical treatment and monitoring in a dedicated COVID-19 unit, until the patient is completely recovered and in a non-infective stage.

Emergency procedures

Emergency scenarios include patients with ST-segment elevation myocardial infarction; patients with emergencies related to non-ST segment elevation acute coronary syndromes; patients with high-grade atrioventricular blocks with risk of sudden death, among other unstable scenarios. In these circumstances, there may be no time to define the diagnosis of COVID-19, and it is recommended to estimate its probability. Low-risk patients are considered negative or without clinical or epidemiological reasons to suspect COVID-19. Patients who meet criteria for a suspected case (fever plus cough or dyspnea, plus epidemiological criteria) should be considered as of high risk for COVID-19; those with compatible symptoms, but who do not meet all criteria, should be considered as of moderate risk (Figure 1).

In cases of patients with a low probability of COVID-19, perform the procedure, if possible, in a "clean" cath lab for non COVID-19 patients, adopting protective measures consistent with the local epidemiological reality.

For patients with moderate or high probability of COVID-19:

- Carry out the procedure in the dedicated COVID-19 cath lab, adopting enhanced protection measures for the entire team;
  OR
- Consider alternative therapies. In patients with ST-segment elevation myocardial infarction, fibrinolysis should be contemplated, considering:
  - Estimated delay in performing primary percutaneous coronary intervention compared to fibrinolysis (a delay >60 minutes favors fibrinolysis).
  - Expectation of effectiveness and contraindications to fibrinolytic therapy.
  - Conditions to ensure adequate anti-infectious protection for healthcare workers in the cath lab.

After fibrinolysis, monitor reperfusion criteria and prepare for the possibility of a rescue percutaneous coronary intervention in the dedicated COVID-19 cath lab, adopting enhanced protection measures for the entire team. In view of reperfusion criteria, monitor the patient in a single room, until diagnostic definition of COVID-19 for the stratification.

LIST OF PRACTICAL ACTIONS

Before the procedure:

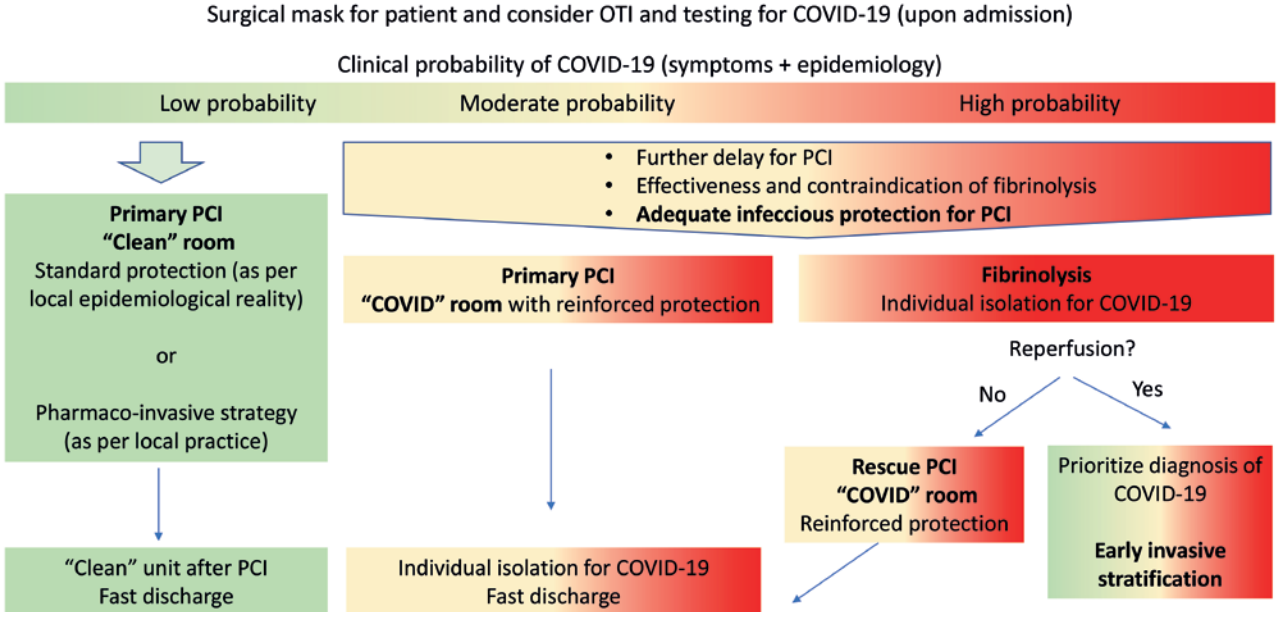
- Review the indication of the procedure, evaluate the risk-benefit ratio of cardiovascular and infectious cases, and consider alternatives, when relevant.
- Assess the probability of COVID-19 in the patient, actively screening for fever, respiratory symptoms, epidemiological exposure and close contacts, with diagnostic tests when appropriate.
- Notify the anesthesiologist in advance.
- Put a surgical mask on the patient and consider orotracheal intubation for unstable cases before transferring the patient to the cath lab.
- Ensure free (express) transit of the patient directly to the procedure room.
- Organize donning procedures for the entire staff, under supervision, and prepare the room before the patient arrives at the laboratory.

During the procedure:

- Select the simplest possible safe treatment strategy (consider, for example, treating the culprit injury only).
- Avoid having professionals entering and exiting the room during the procedure, by keeping the room door closed.
- Monitor the exposure of healthcare professionals during the procedure.

After the procedure:

- Under supervision, remove PPEs to be discarded and protective glasses or face shield to be disinfected, before leaving the contaminated area. The face mask must be removed after leaving the room, with the door closed.
- Keep the room door closed for 1 hour after the procedure, before starting cleaning and disinfection.
- Register and monitor the team that provided care to patients with a confirmed COVID-19 diagnosis.
- Shorten the patient's stay until discharge.



OTI: orotracheal intubation; PCI: percutaneous coronary intervention.

Figure 1. Flowchart in ST-segment elevation myocardial infarction during COVID-19 pandemic.

SOURCE OF FINANCING

None.

DECLARATION OF CONFLICTS OF INTEREST

The authors declare there are no conflicts of interest.

CONTRIBUTION OF AUTHORS

Conception and design of the study: BAAF, RVB, REGSL and RAC; data collection: BAAF, RVB, REGSL and RAC; data interpretation: BAAF, RVB, REGSL and RAC; writing of the text: BAAF, RVB, REGSL and RAC; approval of the final version to be published: BAAF, RVB, REGSL and RAC.

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