Echocardiography Challenges During the Coronavirus Disease 2019 Pandemic

Desafios da Ecocardiografia em Tempos de COVID-19

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The current pandemic has highlighted the urgent need to reorganize echocardiography laboratories to minimize the risk of severe acute respiratory syndrome coronavirus infection transmission. Echocardiography should not be performed during the pandemic in elective cases, especially in cases of suspected or confirmed coronavirus disease 2019 (COVID-19).[1-3] However, in certain cases in which echocardiography is considered essential for the patient's clinical management, healthcare professionals will face the risk of contracting COVID-19. Therefore, any clinical care performed during the pandemic must follow these recommendations to minimize the risks of disease exposure: (a) determine whether the echocardiography is urgent, (b) screen for contamination risk, (c) follow hand hygiene and contact restriction guidelines, and (d) rigorously and rationally use personal protective equipment (PPE) and take precautions regarding droplets and/or aerosols depending on the examination type and contamination risk.[1]

When performing transthoracic echocardiography (TTE) in cases of low COVID-19 risk (patients who are asymptomatic, are from low-risk areas, or who test negative for the virus), proper hand hygiene and the use of gloves and a surgical mask are recommended. When performing TTE in moderate- to high-risk cases (patients who are symptomatic or have suspected or confirmed COVID-19), protective actions and equipment must include proper hand hygiene, gloves, an N95 mask (especially in an intensive care unit [ICU] environment or if the patient is under invasive or non-invasive mechanical ventilation), apron, hat, and eye protection (glasses or face shield).[4] All patients should wear a surgical mask, regardless of the risk. The examination time should be reduced and directed exclusively toward the suspected diagnosis.

Because prolonged contact increases the risk of contamination, several institutions recommend that focused cardiac ultrasonography (point of care), instead of complete TTE,[1-4] be performed by trained intensivists directly involved in ICU patient care to confirm or exclude a specific diagnosis, thus reducing exposure risk for the echocardiographer. However, unnecessary retesting must be avoided; depending on the case complexity, complete TTE may be required to meet the clinical demand. Images must be stored for offline measurement, and echocardiography monitoring can be waived. In hospitalized patients, necessary echocardiography procedures should be conducted at the bedside with as few people present as possible. Echocardiography should be performed using a dedicated machine maintained in the contaminated area and exclusively used for screening infected patients. Additional protective measures can also be implemented, such as covering the device with plastic film and/or inserting a barrier (acrylic or plastic) between the examiner and the patient. Proper cleansing and disinfection of the machines and transducers must be performed immediately after use according to each manufacturer's specifications. A suitable alternative is to use a portable or pocket ultrasound device that facilitates access to the bedside and can be subsequently disinfected.

Transesophageal echocardiography (TEE) is an aerosol-generating procedure that carries a high risk of contamination for equipment and health professionals.[2] Therefore, the incremental value of TEE over TTE must be carefully evaluated to avoid the need for TEE in most cases.[4] Whenever possible, other alternatives, such as repeating TTE or using another imaging method requiring less contact between the examiner and the patient, such as computed tomography, should be considered. In cases in which TEE is required, full PPE is mandatory for aerosol precautions, including gloves, an N95 or similar mask, apron, hat, eye protection (glasses or face shield), foot protection (boots or shoe covers), and, if available, overalls and a protective cap for the transducer.

Physical stress induced during stress echocardiography (SE) increases the risk of contamination by droplets; thus, it should be postponed (low COVID-19 risk patients) or canceled (suspected or confirmed COVID-19 patients). In low COVID-19 risk patients with an appropriate indication for SE, if postponement is not possible or recommended, pharmacological SE should be selected.

The indications for fetal echocardiography are the same as those before the pandemic,[4] and the ideal setting is outside the hospital. There are currently no routine indications for mothers at high COVID-19 risk.

Lung ultrasound is a viable follow-up alternative for patients with COVID-19–associated pneumonia. Nonspecific changes due to this illness have been described, such as abnormalities of the pleural line, appearance and progression of B lines, and

Keywords

COVID-19; Coronavirus Infections; Echocardiography; Diagnostic Imaging.

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Manuscript received 4/13/2020; revised 4/17/2020; accepted 4/17/2020

DOI: 10.5935/2318-8219.20200021

pulmonary consolidation.[5] Pleural effusion is an uncommon finding, and the appearance of A lines is observed in the pulmonary recovery phase.

When is it appropriate to perform echocardiography in low COVID-19 risk patients?

All elective tests should be postponed until the status returns to pre-COVID-19 conditions. The urgency of echocardiography in outpatients should be assessed on a case-by-case basis; however, the suggestion is that urgent tests include only those for which results may prevent adverse events or hospitalization within the subsequent 2-4 weeks.[3] Likely candidates for urgent echocardiography include those with suspected new symptomatic cardiomyopathy (functional class III or IV), worsening of pre-existing heart failure with severe symptoms (syncope, chest pain, functional class III or IV), cancer therapy with cardiotoxic drugs and suspected heart failure or a previous ejection fraction decrease, suspected symptomatic severe aortic stenosis, suspected infectious endocarditis with high pre-test probability, and acute symptoms in patients with a prosthetic valve.[3,6] Routine echocardiography in patients with non-severe symptoms during follow-up or in patients who are not eligible for urgent clinical, surgical, or invasive therapy should be postponed or canceled. Among hospitalized patients, urgent echocardiography indications may be evaluated in consultation with the requesting physician, but they must follow the same indications in place before the pandemic[6] with suitable clinical judgment.

When is it appropriate to perform echocardiography in suspected or confirmed COVID-19 patients?

Echocardiography remains a crucial imaging method during the new coronavirus outbreak, but careful consideration of its indications in COVID-19 patients is vital to reduce the contamination risk for healthcare professionals while ensuring high-quality medical care. It is important to recognize that COVID-19 may generate severe acute cardiovascular manifestations, such as heart failure with reduced ejection fraction (stress cardiomyopathy or myocarditis), acute coronary syndrome, malignant ventricular arrhythmias, and cardiogenic shock.[7-11] Previous cardiovascular disease is commonly observed in COVID-19 patients and associated with a worse prognosis.[7-9] Thus, some researchers advocate conducting TTE in all patients with COVID-19 complications such as electrocardiographic changes, increased troponin levels, or moderate to severe symptoms requiring hospitalization.[12,13] Although there are no formal indications based on solid scientific evidence, the importance of assessing cardiac function is emphasized considering the potential coincidence of previous and acute cardiovascular disease in patients with severe COVID-19. Thus, in some clinical scenarios, the indications for echocardiography in COVID-19 patients that seem justified include[2,3,12,13]:

- Suspected heart failure;
- Cardiomegaly on chest radiography;
- Clinically significant arrhythmias;
- Electrocardiographic changes and/or elevated troponin levels;
- Hemodynamic instability and/or shock; and
- Suspected pulmonary hypertension and/or right ventricular dysfunction.

Considering the need to minimize echocardiographer exposure to the virus and maximize the resources available to high-priority patients, in some situations, an alternative to echocardiography can answer the clinical question. This is especially true for stable patients with dubious symptoms or patients referred for additional imaging examinations. Coronary angiotomography can exclude or confirm acute coronary syndrome in the presence of mild COVID-19–associated pneumonia, a circumstance in which troponin levels may be elevated.[4] Patients with myocardial infarction referred for percutaneous revascularization may undergo left ventricular systolic function assessment using ventriculography. If myocarditis is strongly suspected and magnetic resonance imaging is considered crucial for therapeutic intervention, echocardiography can be initially avoided. Clinicians should also critically consider a normal brain natriuretic peptide level before ordering echocardiography for a dyspneic patient.

As major efforts by the scientific community aim to mitigate the severe health consequences of the COVID-19 pandemic, it becomes challenging to balance the use of echocardiography and other imaging methods to continue providing quality medical care to patients who really need them, without excessively increasing the risk of cross-infection between healthcare professionals and patients. Many of the recommendations herein originate from experts in the field and may evolve further as new scientific evidence accumulates.

Conflict of interest

The author has declared that he has no conflict of interest.

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