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Joint Consensus Statement – Safety Precautions for Doing Echocardiography and Image Acquisition during COVID 19: Indian Academy of Echocardiography, Bangladesh Cardiac Society, Cardiac Society of Nepal, and Sri Lanka College of Cardiology

Rakesh Gupta¹, S. K. Parashar², H. K. Chopra³, Sameer Shrivastava⁴, Satish C. Govind⁵, Abdullah Al Shafi Majumder⁶, A. K. M. Monwarul Islam⁶, Mohsin Ahmed⁶, A. K. M. Mohibullah⁶, Yadav Kumar Deo Bhatt⁷, Deewakar Sharma⁸, Chandra Mani Adhikari⁹, Dipanker Prajapati⁹, M. R. Mubarak¹⁰, Stanley Amarasekara¹¹, G. Vijayraghavan¹², P. Krisham Raju¹³, A. V. Anjaneyulu¹⁴, R. Alagesan¹⁵, R. R. Kasliwal¹⁶, Rajan J. Manjuran¹⁷, S. Shanmugasundrum¹⁸, V. Amuthan¹⁹, S. K. Kaushik²⁰, S. T. Yavagal²¹, Debika Chatterjee²², K. Raghu¹³, C. K. Ponde²³, Manish Bansal¹⁶, G. Gnanavelu²⁴, Rahul Mehrotra²⁵, Sunil Bohra²⁶, S. Veermani²⁷, U. P. Singh²⁸, G. Rajesh²⁹, K. M. Krishnamoorti³⁰, Rishikesh Shah³¹

¹JROP Institute of Echocardiography, Ultrasound and Vascular Doppler, Delhi, India, ²Metro Heart Institute, New Delhi, India, ³Moolchand Medicity, New Delhi, India, ⁴Fortis Escort's Heart Institute, New Delhi, India, ⁵Narayana Institute of Cardiac Sciences, Narayan Health City, Bengaluru, Karnataka, India, ⁶National Institute of Cardiovascular Diseases, Dhaka, Bangladesh, ⁷Norvic Hospital, Kathmandu, Nepal, ⁸HAMS Hospital, Kathmandu, Nepal, ⁹Shahid Gangalal National Heart Center, Kathmandu, Nepal, ¹⁰Lanka Hospital, Colombo, Sri Lanka, ¹¹National Hospital of Sri Lanka, Colombo, Sri Lanka, ¹²Kerala Institute of Medical Sciences, Trivandrum, Kerala, India, ¹³Care Hospital, Hyderabad, Telangana, India, ¹⁴Focus Clinics Panjagutta, Hyderabad, Telangana, India, ¹⁵KM Speciality Hospital, Chennai, Tamil Nadu, India, ¹⁶Medanta Medicity, Gurgaon, Haryana, India, ¹⁷Pushpagiri Institute of Medical Sciences and Research Centre, Tiruvalla, Kerala, India, ¹⁸Billroth Hospital, Chennai, Tamil Nadu, India, ¹⁹Jeyalakshmi Heart Center, Madurai, Tamil Nadu, India, ²⁰GBH American Hospital, Udaipur, Rajasthan, India, ²¹Trinity Hospital and Heart Foundation, Bengaluru, Karnataka, India, ²²RNT NH Institute of Cardiac Sciences, Kolkata, West Bengal, India, ²³P. D. Hinduja National Hospital and MRC, Mumbai, Maharashtra, India, ²⁴Ganesh Heart Care Center, Chennai, Tamil Nadu, India, ²⁵MAX Superspeciality Hospital, New Delhi, India, ²⁶Hosmat Hospital, Bengaluru, Karnataka, India, ²⁷Madurai Medical College, Madurai, Tamil Nadu, India, ²⁸Prime Diagnostic Centre and Heart Institute, Chandigarh, India, ²⁹Medical College, Calicut, Kerala, India, ³⁰Sree Chitra Tirunal Institute for Medical Sciences and Technology, Trivandrum, Kerala, India, ³¹Jupiter Hospital, Thane, Maharashtra, India

Abstract

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An echocardiographic investigation is one of the key modalities of diagnosis in patients suffering from COVID 19, especially if they are elderly, have associated comorbid conditions, and pregnant. Hence, it is becoming extremely essential to look into the correct safety precautions, health-care professionals must take while conducting an echo investigation. At the same time, a focused echo examination aimed at correct imaging view acquisition in the shortest possible time is the need of the hour. The decision matrix formulated for conducting an echocardiographic evaluation is based on the presence or absence of cardiological comorbidity vis-a-vis positive or suspected for COVID-19. The safety measures and image acquisition have been constructed keeping in mind the current safety precautions by the World Health Organization, the Centers for Disease Control and Prevention, and the Ministry of Health and Family Welfare, India.

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Address for correspondence: Dr. Rakesh Gupta, JROP Institute of Echocardiography, Ultrasound and Vascular Doppler, C 1/16, Ashok Vihar II, Delhi 110 052, India. E mail: rakeshecho@gmail.com

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Abbreviations

COVID-19 = Corona Virus Disease-19
 TTE = Transthoracic echocardiography
 LV = Left ventricle
 RV = Right ventricle
 RA = Right atrium
 ICU = Intensive care unit
 OPD = Out patient department
 PPE = Personal protection Equipment
 PLAX = Parasternal long axis
 CFM = Colour flow mapping
 PSAX = Parasternal short axis
 PW = Pulse wave
 RVOT = Right ventricular outflow tract
 AP4C = Apical 4 chamber
 MV = Mitral Valve
 TAPSE = Tricuspid annular plane systolic excursion
 CCTDI = Color coded tissue doppler imaging
 AP2C = Apical 2 chamber
 AP3C = Apical 3 chamber
 AP5C = Apical 5 chamber
 LVOT = Left ventricular outflow tract
 IVC = Inferior vena cava
 TEE = Transesophageal echocardiography

Introduction:

The global coronavirus disease 2019 (COVID-19) pandemic is an unprecedented, rapidly spreading public health emergency which spread over 200 countries with 18,039,067 cases with 689,100 deaths and 11,339,675 recovered patients as on August 02, 2020. Of the remaining 6,010,292 cases, the major challenge is 65,776 (1%), who are hospitalized in serious and critical conditions.¹ Another major challenge is COVID-19 recovered patients (11,339,675), who are coming back with their cardiovascular symptoms, requiring noninvasive evaluation including echocardiography.

The COVID 19 virus has affected the provision of health care services all over the world,² including South Asia. Health-care workers are at higher risk because this virus can spread very easily. This is especially true for the echocardiographers due to the close contact involved in the performance of echocardiographic studies. The virus carries a relatively high mortality and morbidity risk, particularly for certain populations (the elderly, the chronically ill, the immunocompromised, and, possibly, pregnant women).³ Given the risk of

cardiovascular complications in the setting of COVID-19, including preexisting cardiac disease, acute cardiac injury, and drug-related myocardial damage,⁴ echocardiography services are required in certain selected cases in the care of patients with suspected or confirmed COVID-19. Consequently, echocardiography providers will have a high risk of exposure to COVID-19.⁵ Despite the growing evidence of cardiovascular complications associated with the novel COVID-19, there is very little data regarding the performance of transthoracic echocardiography (TTE) in a step-wise method, especially views that are to be acquired in focused echocardiography for subsequent analysis.

The Indian Academy of Echocardiography along with the Bangladesh Cardiac Society, Cardiac Society of Nepal, and Sri Lanka College of Cardiology acknowledges the sincere efforts of all the various bodies (viz., your institute or hospital, local and state health authorities, Ministry of Health and Family Welfare, and Indian Council of Medical Research) in devising this paper. The purpose of this position paper is to supplement, not to override, valuable guidance from any of these bodies.

Indications for transthoracic echocardiography

TTE should be performed in patients who are COVID-19 suspected or confirmed only when the echocardiography study is expected to provide clinical benefit. Patients with elevated cardiac biomarkers are more likely to exhibit cardiac abnormalities in the form of reduced left ventricular function, dilated right ventricle (RV)–right atrium (RA), and reduced RV systolic function. In appropriately selected patients, TTE can guide COVID-19 cardiac involvement, complications, and clinical management.⁶

Safety precautions

The most part of safety precautions is that in today's scenario, many asymptomatic patients are visiting echocardiography labs for their cardiac evaluation. All patients should be treated like COVID-19 suspected and appropriate precautions as mentioned below should be taken. These safety precautions should be such that they apply to most of the developing countries in this part of the

world. They should be innovative, cost effective, and less time consuming. Hence, considering these points, the following guidelines were made:

1. The echocardiography machine should be separate for COVID-19 ward/intensive care unit and COVID-19-suspected ward and outpatient department.
2. In all indoor patients of COVID-19, focused echocardiography should be done bedside with complete personal protection equipment.
3. The echocardiography machine should be properly covered with a disposable plastic sheet.
4. The probes should be cleaned thoroughly with soap and water solution or sanitizer/Cidex swab after each echocardiography examination.
5. The examination bed should be covered with a disposable plastic sheet that can be cleaned with sodium hypochlorite solution after each echocardiography examination.
6. Only trained cardiologists, preferably young without any comorbidities, should be deputed for doing echocardiography tests for the COVID-19-positive or -suspected patients. Elderly physicians with or without comorbid conditions should be discouraged to perform echocardiography by themselves.
7. To perform the echocardiography test: The cardiologist should be wearing a Level 3 personal protective equipment (PPE) gear while working in the COVID-19 ward, and at least Level 2 PPE gear, if working in the COVID-19-suspected ward.[7] The donning and doffing of PPE gears should be done as per guidelines.⁶
8. There should be a plastic curtain between the patient and the cardiologist doing an echocardiography examination.
9. There should be the provision of a heavy-duty exhaust fan near the patient's bed, away from the examiner.
10. Under no circumstances, the examiner should sit on the patient's bed for performing echocardiography.
11. The patient coming for the examination should wear a face mask and front-opening shirt/gown without any banyan/vest.
12. In this part of the world, the majority of echocardiography labs have a single room for performance and reading of echocardiography, leading to a high traffic area. All sanitization procedures should be adopted for sanitization of computer, door, handles, metallic parts, switchboard with cidex, and sodium hypochlorite solution.⁸⁻¹⁰
13. Various detailed precautions are advised in the guidelines published by the Cardiological Society of India⁷ and other cardiac societies.

View acquisition

A focused study should be performed quickly. The views, which are acquired in these circumstances without compromising the quality of an exam, should be to the point and useful for subsequent analysis, without any electrocardiogram gating. The number of views will be the minimum necessary for the purpose of making the decision to minimize the duration of an examination.^{11,12}

Parasternal window

- a) Parasternal long-axis view with color flow mapping (CFM) covering mitral and aortic valve (.avi clip).
- b) RV–RA inflow view with CFM (.avi clip).
- c) Parasternal short-axis (PSAX) view at aorta with CFM at pulmonic valve and tricuspid valve (.avi clip).
- d) PSAX view at aorta with CFM at pulmonic valve and pulse wave (PW) spectrum at right ventricular outflow tract (Doppler waveform).

Apical window

- a) Apical four-chamber (AP4C) view with CFM on mitral and tricuspid valves (.avi clip).
- b) AP4C view with CFM at the mitral valve (MV) and PW Doppler spectrum pattern at MV (Doppler waveform).
- c) AP4C view with color-coded tissue Doppler imaging (CCTDI) at the septum and PW Doppler spectrum pattern at mitral annulus (Doppler waveform).
- d) AP4C view with M-Mode at tricuspid annulus (Doppler waveform). It is also known as tricuspid annular plane systolic excursion.

- e) AP4C view with CCTDI at RV free wall and PW Doppler spectrum pattern at tricuspid annulus (Doppler waveform).
- f) Apical two-chamber view with CFM at the MV (.avi clip).
- g) Apical three-chamber view with CFM at mitral and aortic valves (.avi clip).
- h) Apical five chamber (AP5C) view with CFM at mitral, aortic, and tricuspid valves (.avi clip).
- i) AP5C view with CFM at aortic valve with the PW spectrum at the left ventricular outflow tract (Doppler waveform).
- j) Apical focused RV view with CFM at the tricuspid valve (.avi clip).
- k) Apical focused RV view with CFM at the tricuspid valve and CW Doppler spectrum pattern across the tricuspid valve (Doppler waveform).
- b) Only those cases, where it is still felt that a TEE will have a significant and immediate impact on patient management, should be undertaken in consultation with other involved specialties.
- c) Surgical colleagues should be involved, ensuring that the operation remains possible if indicated, or with microbiology colleagues to discuss potential treatment strategies for the management of infective endocarditis.
- d) Perioperative TEE should be performed only if there is a favorable risk: benefit ratio while taking into account the added risk of COVID-19 transmission. The added airway protection provided by a cuffed endotracheal tube and closed circuit ought to reduce the risk of aerosol generation in an anesthetized, paralyzed, and ventilated patient. However, the longer duration and exposure to airway secretions may increase infection risk. Care must be taken to avoid accidental extubation and disconnection of the anesthetic circuit.¹⁶⁻¹⁸

Subcostal window

- a) Subcostal view with CFM at the tricuspid view (.avi clip)
- b) Inferior vena cava dynamic view (.avi clip).

Stress echocardiography

The treadmill or bicycle stress echocardiography tests in patients with COVID-19 may lead to exposure because of deep breathing and/or coughing during exercise. These tests should generally be deferred or converted to pharmacologic stress echocardiography, if essential, for patient management.

Transesophageal echocardiography

Transoesophageal echocardiography (TEE) carries a very high risk of exposure to aerosolized secretion and subsequently carries an increased risk of COVID-19 transmission. In addition, the symptom profile of COVID 19 is imprecise and heterogeneous, making it hard to assess who is currently a vector. Moreover, it is presumed that COVID-19 is now widespread in this region. We, therefore, recommend the following:¹³⁻¹⁵

- a) All routine TEE cases should be canceled. Alternative imaging modalities may be considered that may provide the necessary information.

- e) Appropriate PPE should be worn by all personnel involved in all TEE examinations, including the use of an appropriately fit tested mask.
- f) Appropriate decontamination of the procedure room and equipment should be undertaken after each procedure.

Summary

The present COVID-19 pandemic is a medical emergency of an unprecedented scale in recent human history with constantly evolving strategies. As we continue to handle the onslaught of this pandemic, strategies may continue to evolve further. In any given patient with COVID-19,¹⁹⁻²¹ clinical assessment along with inflammatory markers will be necessary to determine whether the patient is experiencing a primary coronary event or other cardiac involvement. If there is a suspicion of cardiac involvement, the risk to benefit ratio of performing echocardiography becomes extremely helpful in deciding the need for the same. If the echocardiography is performed, it should be focused and should be performed following all the protocols as outlined above, especially the health-care provider's protection.

The stress echocardiography should be deferred, and, if at all it is a necessity, then pharmacological echocardiography should be done. Similarly, the performance of TEE should be considered only in highly selected cases that are mandatory for a patient undergoing emergency interventional procedures. Other imaging modalities should be considered in this place to proving the required necessary information.

Conflict of Interest - None.

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