Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Hellenic Journal of Cardiology 62 (2021) 180–181

Contents lists available at ScienceDirect

Hellenic Journal of Cardiology

journal homepage: http://www.journals.elsevier.com/hellenic-journal-of-cardiology/

Correspondence

A reappraisal of the role of transthoracic ultrasound in the era of COVID-19: Patient evaluation through new windows

Keywords:
Echocardiography
COVID-19

The 2019 novel coronavirus disease (COVID-19) is an outbreak of respiratory disease causing severe acute respiratory syndrome.[1] As of May 7, 2020, a total of 3.76 million cases have been confirmed, and more than 264,000 deaths have been reported all over the world.

The cardiovascular system is the second most affected target of COVID-19, and hence early diagnosis of cardiac involvement should guide treatment decisions. SARS-CoV-2 infection acts as a triggering factor for cardiac events; therefore, under the current pandemic, COVID-19 should be included in the differential diagnosis even for patients presenting with typical chest pain or other equivalent symptoms for acute cardiac event. Hence, the availability of diagnostic techniques such as x-ray, transthoracic echocardiography (TTE), and chest CT, as well as supporting therapeutic devices in hemodynamically unstable patients, are of importance.

New recommendations have already published by EACVI focused on the use of TTE in the COVID-19 era.[2] TTE as a readily available bedside image modality offers precise information and treatment guidance particularly in ICU patients.[3,4] Beyond the imaging protocol, the echocardiographic study must be performed according to institutional standards to prevent viral transmission and reassure operator safety. As a result, the echocardiographic examination in suspected or confirmed cases of COVID-19 should be focused but comprehensive enough to answer the diagnostic indication and the clinical question. Prolonged examinations should be avoided to minimize infectious risk. To this point, the greater the physician's knowledge and experience, the sooner and more accurate the diagnosis, which helps to minimize infectious exposure. Regarding the diagnostic approach, the use of pocket devices seems to be feasible for preventing viral transmission. It is also important to balance the benefits to the examined patient with the potential risks for other patients or the staff (Fig. 1). Identification of COVID-19 cardiovascular complications by cardiologists should be considered challenging. Myocarditis, acute myocardial infarction (mainly type II), and stress cardiomyopathy are common complications, while pericarditis is reported rarely. There are several putative mechanisms of cardiac injury in COVID-19 patients such as ACE2-mediated direct damage, hypoxia-induced myocardial injury, cardiac microvascular daage, and systemic inflammatory response syndrome.

One step further, it is known that lung parenchyma is not normally visible beyond the pleura due to the presence of gas. [5-7] Normal lung aeration is defined as the presence of A lines and/or < three B lines. Interstitial syndrome (edema, fibrosis, SARS-COV-2 viral pneumonia) is characterized by accumulation of extravascular fluid within the interstitial space, and the interface gas/tissue produces vertical artefacts which are detected as B lines. The differentiation of pulmonary edema and pneumonia is particularly important in this group of patients. Several tips and tricks have been applied regarding the use of transthoracic ultrasound for the evaluation of lung disease. It should be focused on three different ultrasound patterns—normal aeration, interstitial–alveolar syndrome (moderate to severe loss of aeration), and lung consolidation (complete loss of aeration)—in order to classify different stages of the pulmonary disease.

In more detail, interstitial pneumonia is characterized by multiple B lines that are irregularly spaced and arising from the pleural line with limited lung sliding.[6,7] In addition, in non-critical SARS-COV-2 pneumonia, multiple B lines are irregularly spaced and arise from small subpleural consolidations. On the other hand, in cases of life-threatening pulmonary edema, coalescent B lines that are arising from the pleural line and observable in several intercostal spaces are depicted. In cases that also present with severe loss of aeriation (cases with diffuse alveolar-interstitial syndrome and acute respiratory distress syndrome - ARDS), coalescent B lines from subpleural consolidations should be observed in several intercostal spaces. Finally, lung consolidation is detected by lung ultrasound as a tissue structure with hyperechoic punctiform images (static air bronchogram).

Complete transthoracic ultrasound, involving heart and lung examination, influences clinical decision-making and enables the diagnosis and treatment follow-up in acute cardiorespiratory situations such as respiratory distress syndrome, pulmonary edema, infectious pneumonia, lung contusion, pleural effusion, and pneumothorax. Hence, it is a useful clinical tool during a critical patient's close follow-up in ICU.

Is the complete transthoracic ultrasound more reliable than transthoracic echocardiography in the era of COVID-19? Nowadays, this diagnostic approach should open new windows in thinking

Peer review under responsibility of Hellenic Society of Cardiology.

https://doi.org/10.1016/j.hjc.2020.06.003

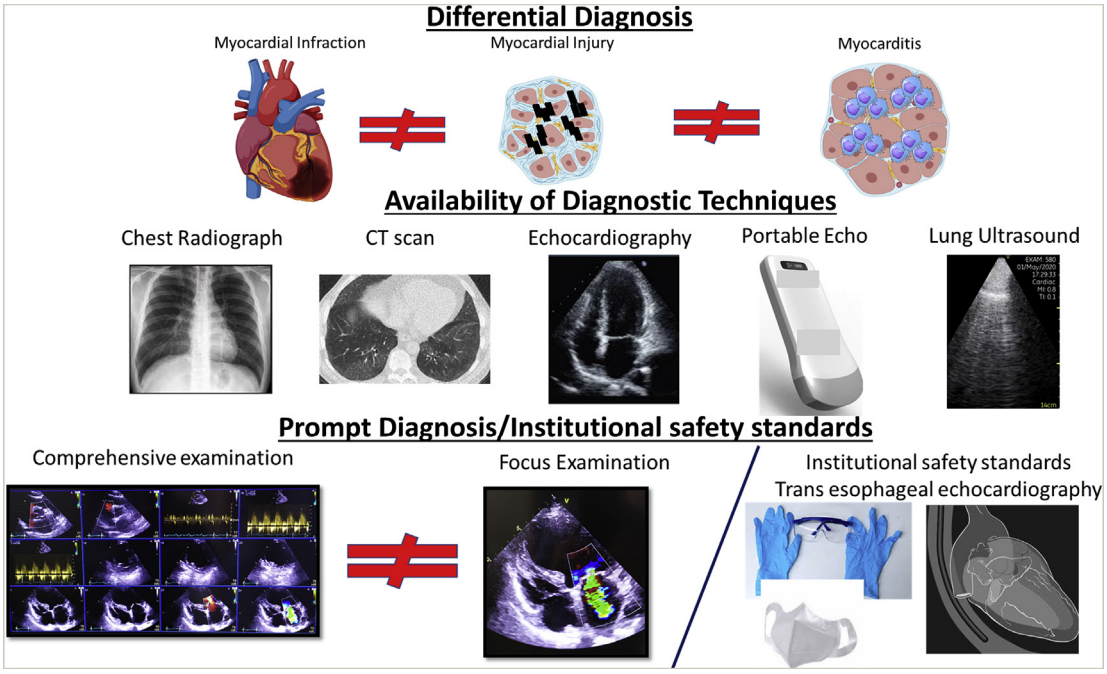

Fig. 1. Challenges in the echocardiographic approach in the era of the COVID-19 pandemic.

and to the future clinical practice of ultrasound by cardiac imaging specialists.

References

[1]. Lu R, Zhao X, Li J, et al. Genomic characterisation and epidemiology of 2019 novel coronavirus: implications for virus origins and receptor binding. *Lancet*. 2020;395:565–574. https://doi.org/10.1016/S0140-6736(20)30251-8.

[2]. Skulstad H, Cosyns B, Popescu BA, et al. COVID-19 pandemic and cardiac imaging: EACVI recommendations on precautions, indications, prioritization, and protection for patients and healthcare personnel. *Eur Heart J Cardiovasc Imag*. 2020. https://doi.org/10.1093/ehjci/jeaa072.

[3]. Poulidakis E, Aggeli C, Kappos K, et al. Echocardiography for the management of patients with biventricular pacing: Possible roles in cardiac resynchronization therapy implementation. *Hellenic J Cardiol*. 2018;59:306–312. https://doi.org/10.1016/j.hjc.2018.02.006.

[4]. Vavuranakis M, Kalogeras K, Lozos V, et al. Transapical closure of multiple mitral paravalvular leaks with dual device deployment through a single sheath: a Heart Team job. *Hellenic J Cardiol*. 2018;59:367–369. https://doi.org/10.1016/j.hjc.2018.01.007.

[5]. Arbelot C, Dexheimer Neto FL, Gao Y, et al. Lung Ultrasound in Emergency and Critically Ill Patients: Number of Supervised Exams to Reach Basic Competence. *Anesthesiology*. 2020;132:899–907. https://doi.org/10.1097/ALN.0000000000003096.

[6]. Vetrugno L, Bove T, Orso D, et al. Our Italian experience using lung ultrasound for identification, grading and serial follow-up of severity of lung involvement for management of patients with COVID-19. *Echocardiography*. 2020;37:625–627. https://doi.org/10.1111/echo.14664.

[7]. Picano E, Scali MC, Ciampi Q, Lichtenstein D. Lung Ultrasound for the Cardiologist. *JACC Cardiovasc Imag*. 2018;11:1692–1705. https://doi.org/10.1016/j.jcmg.2018.06.023.

Constantina Aggeli*, Evangelos Oikonomou, Dimitris Tousoulis
1st Cardiology Clinic, 'Hippokration' General Hospital, National and Kapodistrian University of Athens, School of Medicine, Athens, Greece

* Corresponding author. Associate Professor Constantina Aggeli M.D., Ph.D., 1st Cardiology Department, Athens Medical School, National and Kapodistrian Universty of Athens, Hippokration Hospital Argyrokastrou 14, Vrilissia, 15 325, Greece. Tel:+ 30 693 2722510.
E-mail address: dina.aggeli@gmail.com (C. Aggeli).

8 May 2020
Available online 11 June 2020