

AN INTERVIEW WITH...

Alaide Chieffo, MD

Dr. Chieffo shares insight into the COVID-19 pandemic, including what designates a cardiac emergency, cardiovascular complications from the virus, advice for cath labs, and thoughts about mechanical circulatory support.



As an interventional cardiologist in a highly affected area (Milan in Italy's Lombardy region), we'd appreciate your insight from the front lines of the pandemic. How are you determining which cardiac procedures to postpone and which are emergencies?

As described in the recently published European Association of Percutaneous Cardiovascular Interventions (EAPCI) position statement on invasive management of acute coronary syndromes during the COVID-19 pandemic,¹ there is a substantial difference among regions in Europe in terms of local health care resources, pandemic density of COVID-19 outbreak, and changes of the pandemic over time. These variations have a wide range of implications for national/regional health care services, national health care authorities, and in-hospital redistribution of resources. Regions within a country can be categorized into three groups (marginal, moderate, and heavy) according to the degree of involvement in the pandemic, and subsequently, with different implications for the health care system. In this context, a strategy is needed to identify which patients are in stable condition, allowing the postponement of procedures for those who are not stable. A strategic categorization of coronary interventions during COVID-19 pandemic is therefore needed: emergent (do not postpone), urgent (perform within days), lower priority (perform within < 3 months), elective (may be postponed > 3 months). An obvious concern has been to maintain the standard of care and timely access of patients with acute coronary syndrome (ACS), including ST-segment elevation myocardial infarction (STEMI) and reperfusion therapy. In patients with chronic coronary syndromes, principles of prioritization are based on risk stratification, taking into account the prognostic implications of symptoms and known presence of critical disease of the left main stem or the proximal left anterior descending coronary artery.

What cardiovascular complications are you seeing from COVID-19?

We recently published our experience in the Lombardy region with confirmed COVID-19 patients who underwent urgent coronary angiography due to STEMI between February 20 (the date of the first COVID-19 case in Lombardy) and March 30, 2020.² A total of 28 COVID-19 patients with STEMI were included, and all patients met the European Society of Cardiology guidelines' definition of STEMI.

For 24 (85.7%) patients, the STEMI represented the first clinical manifestation of COVID-19, and they did not have a COVID-19 test result at the time of coronary angiography. Twenty-two (78.6%) patients presented with typical chest pain associated or not associated with dyspnea, and six (21.4%) patients had dyspnea without chest pain. All patients underwent urgent coronary angiography, and none were treated with fibrinolysis. Interestingly, out of the 28 patients, 17 (60.7%) patients had evidence of a culprit lesion requiring revascularization, and 11 (39.3%) patients did not have obstructive coronary artery disease. In patients in whom a culprit lesion was excluded by coronary angiography, we were unable to determine whether the clinical presentation was due to type 2 myocardial infarction (MI), myocarditis subsequent to SARS-CoV-2 infection, SARS-CoV-2-related endothelial dysfunction, or cytokine storm.

However, from the current literature,^{3,4} we know that in patients hospitalized with COVID-19, 5% to 25% had elevations in cardiac troponin (cTn), with a higher prevalence in those admitted to the intensive care unit and also in those who died. Troponin elevation increased with COVID-19 illness deterioration and was associated with a worse prognosis. The underlying mechanisms of acute myocardial injury in COVID-19 patients are poorly understood and may include (1) direct viral and cytopathic effect; (2) cytokine release syndrome potentially leading to microinfarction; (3) type 1 MI (in patients with or without previous coronary artery disease); (4) type 2 MI in patients with severe respiratory distress/severe hypoxemia;

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and (5) myocarditis shock as part of COVID-19–related shock or Takotsubo syndrome. Nevertheless, the use of coronary angiography for COVID-19–positive patients with elevated cTn should be restricted to those in whom type 1 MI is suspected.

Troponin elevation in patients with COVID-19 infection seems to be lower than in most cases of ACS or acute myocarditis. In case of marked elevation (eg, > 5 times the upper limit of normal) in a patient who is not critically ill, myocarditis, Takotsubo syndrome, spontaneous coronary dissection, or type 1 MI should be suspected.

What advice would you give to other hospitals and cath labs preparing for a surge in COVID-19 cases?

First, the emergency department (ED) and hospital pathways in regions with moderate or heavy involvement need to be reorganized. The ED should have different entry points for cardiovascular emergencies, as well as hot (COVID-19) and cold (non–COVID-19) areas. In addition, hospital pathways should be redesigned to allocate patients according to their admission symptoms: to a COVID-19 or non–COVID-19 ward based on SARS-CoV-2 test result and potentially to the intensive care unit based on clinical presentation and stability.

Regarding how to prepare cath labs and guarantee protection to health care workers (HCWs), national societies have published specific protocols,^{4,5} and the EAPCI position statement also gave some specific indications.¹ It is recommended to separate HCWs into groups to potentially reduce exposure, therefore limiting the operators who may be required to be in quarantine at the same time. It is also suggested to identify one dedicated cath lab for the treatment of suspected or confirmed COVID-19 cases. The dedicated cath lab must be fully equipped, with all interventional materials stored inside (ideally behind closed cupboard doors) to avoid entry and exit of the staff members during the procedure. A daily checklist for the presence of adequate personal protective equipment (PPE) in the cath lab and for the dedicated crash cart should be completed. It is crucial to establish clear pathways for COVID-19 patients in the cath lab at each intervention center. Only three HCWs involved in the procedure should remain inside the cath lab; the cath lab doors should be kept closed at all times. Patients should have surgical masks, and all HCWs involved in the cath lab intervention need complete PPE. All HCWs have to be routinely trained in the correct use of PPE (ie, donning and doffing).

What are your thoughts on the use of mechanical circulatory support in patients with COVID-19?

Recent data showed that shock of undetermined etiology occurs in up to 12% of COVID-19 patients.¹ Severe

cardiac dysfunction in COVID-19–positive patients may occur from a number of mechanisms, including myocarditis or acute myocardial injury/type 2 MI triggered by imbalance of oxygen demand and supply associated with increased breathing work and severe hypoxemia. Except for viral myocarditis, there is limited knowledge regarding the use of percutaneous ventricular assist devices (pVADs) for hemodynamic support in previous influenza outbreaks, because more focus has been placed on respiratory support. However, if hemodynamic instability persists despite maximal medical therapy, the escalation to pVAD has to be considered, and patients should be transferred and further managed in expert centers that may offer different choices of mechanical circulatory support.¹ An intra-aortic balloon pump may be an option in hemodynamically depressed COVID-19 positive patients presenting with STEMI and mechanical complications. Regarding the use of percutaneous venovenous (VV) or venoarterial (VA) extracorporeal membrane oxygenation (ECMO), patients with COVID-19 present a high prevalence of developing severe acute respiratory distress syndrome requiring high positive end-expiratory pressure and driving pressure. In case of refractory hypoxemia despite optimal medical and ventilator strategy, VV-ECMO should be considered to down-titrate intrathoracic pressure and reduce right ventricular afterload. If further hemodynamic support is needed, consideration should be given to either a percutaneous oxy right ventricular assist device or, alternatively, upgrading to VA-ECMO. VA-ECMO supports both lungs and cardiac functions and is considered the device of choice in COVID-19 patients with hemodynamic and respiratory failure. In addition, axial flow pumps may be used to manage left ventricular overdistention in patients receiving VA-ECMO. ■

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Disclosures: Speaker/consultant fees for Abbott; Abiomed; Biosensor; Cordis, a Cardinal Health company; Magenta Medical.