

Cardiovascular Medicine in the Era of COVID-19 Pandemics

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Severe acute respiratory syndrome-coronavirus-2 (SARS-CoV-2) or COVID-19 pandemics has remained a riding factor globally for the past 2 years and has dramatically impacted daily cardiovascular practice and research.^[1-3] Reminiscent of outbreaks of infectious diseases over the decades including SARS-CoV-1, Zika virus, Ebola, and Chikungunya virus, COVID-19 infection caught us off guard and has contributed to variation in clinical manifestations of acute coronary syndrome (ACS), ischemic and nonischemic myocardial injury, and hypertension, with fewer individuals receiving the primary percutaneous coronary intervention and less in-hospital care for myocardial infarction (MI). Moving forward into 2022, a number of trends and challenges have caught the attention of physicians and scientists in this era of COVID-19. It is thus pertinent to launch clinical guidelines and preventive measures for cardiovascular procedures in patients afflicted with COVID-19. One of the major impacts that COVID-19 has embarked on medicine is the severe cardiovascular complications in COVID-19 patients. Cardiovascular symptoms associated with severe COVID-19 encompass heart failure, coronary artery disease, various cardiomyopathies, hypertension, and cerebrovascular disease/stroke. In this context, our issue tackles on some of the burning issues in cardiovascular medicine related to COVID-19.^[3-5]

In the first article, Zhao (Beijing Anzhen Hospital) and Smith (University of Chapel Hill) evaluated the current patient care standard for ACS, a severe stage of ischemic heart disease with high risk of death. From the clinical perspective in general care offered to ACS patients by the health system and medical providers seems to correlate with the likelihood of desired

health outcomes or prognosis in these patients. Zhao and Smith summarized the several important issues in quality of care for ACS including the assessment of the quality of care for ACS, main strategies for upgrading the quality of care for ACS patients in acute and chronic phases. They compared the efforts on ACS quality care improvement through the specific programs in Western countries and in China.^[6] In the second article, Parise *et al.* from Auburn University discussed the unique feature of cardiovascular complications in COVID-19 infection as opposed to other prevalent viruses. COVID-19 may intervene in cardiovascular homeostasis through various mechanisms including direct viral entry, cytokine storm, inflammation, hypoxia, interferon (IL)-mediated immune response, plaque destabilization, and stress. Compared with other viral attacks, certain machineries are similar across all viruses, while others are more severe for COVID-19. Many individual factors such as old age, gender, and obesity may have contributed to the high prevalence of virus-associated complications and mortality. Compared with other viruses, COVID-19 seems to activate disparate cytokine profiles.^[7] Next, Tam and Siu from the University of Hong Kong dissected the challenge in the management of ST-segment elevation MI (STEMI), a clinical emergency necessitating swift establishment of care system during the COVID-19 pandemics. The impact of COVID-19 on STEMI care, ranging from disease severity, patient delay, diagnostic difficulty, triage to reperfusion strategy, and postoperative care, is drastic. In-hospital transmission can quickly evolve into nosocomial outbreaks with caretaker infection and quarantine which lead to health-care system collapse. These authors discussed challenges in the

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various aspects of STEMI management during the COVID-19.^[8] In the fourth article, Jia and Sowers from the University of Missouri Columbia summarized the recent epidemiological findings of hypertension in COVID-19 patients and emphasized the essential role for angiotensin-converting enzyme-2 (ACE-2), a receptor for SARS-CoV-2, and viral entry into cells. Epidemiological data have revealed that hypertension is a frequent comorbidity and an independent prognostic risk factor in COVID-19 patients. They discussed the possible contribution of endothelial dysfunction, inflammation, and arterial stiffness in the prevalence of hypertension and cardiovascular disease in COVID-19 patients. They also commented on therapeutic strategies for managing hypertension in COVID-19 patients, with particular focus on ACE inhibitors, angiotensin receptor blockers, and calcium channel blockers.^[9] In the fifth article, Li *et al.* from the University of Manitoba provided insights into the complex interplay between inflammation and myocardial ischemia-reperfusion (I/R), a major cause of death. I/R is commonly associated with pro-inflammatory responses to augment postischemic injury and remodeling. Myocardial ischemia injury and acute MI remain the leading causes of death in patients with cardiovascular diseases.^[10-12] Interestingly, certain pro-inflammatory factors, including tumor necrosis factor-alpha, IL-1, IL-6, melanocyte-stimulating hormone-inhibiting factor, and D-dopachrome tautomerase may in fact improve the cell survival and compensate energy deprivation in acute I/R. To this end, selective targeting of pro-inflammatory factors is expected to display disparate therapeutic outcomes in the treatment of heart attack.^[13] In the sixth article, Pan *et al.* from Zhongshan Hospital Fudan University summarized the evidence that argued for and against coronary artery fistula closure and offered a balanced view of the *pros and cons* for coronary artery fistula closure in patients with different types of coronary artery fistula.^[14] In the last article, Zhao *et al.* from Stanford University assessed macrophage polarization into M1 and M2 phenotypes in ischemic brain following stroke. These authors employed *in vivo* and *in vitro* techniques to examine whether distinctive M1 and M2 types truly exist or not and evaluated their effects on brain injury evoked by stroke.^[15]

Although our society, physicians, and scientists have admirably responded to COVID-19 pandemic, many issues still exist to compromise the timely and target therapy for COVID-19-related cardiovascular diseases including health-care barriers, early detection, and preventative management for individual risk factors. Loss of human life and socioeconomic contact during the COVID-19 pandemic should be deemed

as a warning whistle for our society, physicians, and scientists, or our descendants will suffer again in future. Although our theme issue has shed some insights toward cardiovascular medicine in this COVID-19 pandemic, we have failed in a large part identifying the specific target (s) or drug (s) on COVID-19-associated cardiovascular anomalies. This reflects the overall challenge and difficulty in the mechanism behind COVID-19 pathology. We hope that this theme issue will serve as a little step toward launching better intervention regimens for COVID-19-associated cardiovascular anomalies.

Conflicts of interest

Jun Ren is an Editorial Board member of Cardiology Plus. The article was subject to the journal's standard procedures, with peer review handled independently of this Editorial Board member and their research groups.

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