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Considerations When Managing Heart Failure during the COVID-19 Pandemic-Consensus from the Taiwan Society of Cardiology

Kun-Chang Lin,[1] Chun-Chieh Wang,[2]* Wei-Chun Huang[1,3,4] and Juey-Jen Hwang[5,6]*

Coronavirus disease 2019 (COVID-19) has spread rapidly around the world since December 2019. Acute heart failure has accounted for 23-24% of the initial presentations in patients with COVID-19 infection. Furthermore, COVID-19 might increase metabolic demand and cause acute decompensation of pre-existing stable heart failure. These patients are thus more susceptible to the evolution of more serious clinical symptoms and a higher mortality rate. Given the lack of knowledge about this new disease, this review provides recommendations for the management of heart failure during the COVID-19 pandemic in Taiwan.

Key Words: COVID-19 • Heart failure • SARS-CoV-2

INTRODUCTION

Since infection with coronavirus disease 2019 (COVID-19) was first noted in late December 2019 in the Chinese city of Wuhan, Hubei province, there has been accelerated and aggressive growth in the number of infected cases around the world, pushing healthcare system to the brink of collapse. The magnitude of the crisis has been so severe that the World Health Organization declared COVID-19 to be a pandemic on March 12, 2020.

During April 2003, Taiwan suffered one of the most devastating experiences during the outbreak of severe acute respiratory syndrome (SARS), with 346 cases of infected patients and 37 deaths. The experiences and lessons learned from the SARS outbreak allowed Taiwan to be better prepared to mitigate the impact of the COVID-19 pandemic and to be able to give a timely and effective response for the protection of public health.

According to the most recent epidemiological data, a large number of people around the world will be infected by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), even though most of the infected cases will be mild or even asymptomatic.[1] However, the infection can be serious, especially in patients with chronic diseases such as pulmonary and cardiovascular disease and immunosuppressed patients. Congestive heart failure is one of the most common chronic cardiovascular diseases, and according to a recent study, these patients are more susceptible to the evolution of more serious clinical symptoms and a higher mortality rate. SARS beta-coronavirus infections have been reported to be associated with signs and symptoms of heart failure.[2]

COVID-19 AND HEART FAILURE

Adverse cardiovascular sequalae have been reported

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[1]Department of Critical Care Medicine, Kaohsiung Veterans General Hospital, Kaohsiung; [2]Division of Cardiology, Department of Internal Medicine, Linkou Chang Gung Memorial Hospital and Chang Gung University, Taoyuan; [3]School of Medicine, National Yang-Ming University, Taipei; [4]Department of Physical Therapy, Fooyin University, Kaohsiung; [5]Division of Cardiology, Department of Internal Medicine, National Taiwan University College of Medicine and Hospital, Taipei; [6]National Taiwan University Hospital Yulin Branch, Yulin, Taiwan.
Corresponding author: Dr. Wei-Chun Huang, Department of Critical Care Medicine, Kaohsiung Veterans General Hospital, No. 386, Dazhong 1st Road, Zuoying District, Kaohsiung City 813 Taiwan. Tel: 886-7-346-8278; Fax: 886-7-345-5045, E-mail: wchuanglulu@gmail.com
* Both authors contributed equally to this work.

in patients with COVID-19, including myocarditis, acute myocardial infarction, and heart failure.[3,4] In a previous report of 113 patients who died from COVID-19 infection, 49% of the patients were complicated with heart failure.[5] Other studies have reported that acute heart failure accounted for 23-24% of the initial presentations in patients with COVID-19 infection.[5-7] Non-survivors with COVID-19 have also been reported to have a higher percentage (52%) of heart failure than survivors (12%).[6,8] Patients with end-stage heart failure have also been shown to have a higher mortality rate after COVID-19 infection.[9] The possible risk factors include older age, poor general condition, more comorbidities, and severe myocardial injury.[9]

Heart failure has been found to be the most common critical complication during exacerbations of COVID-19, even in patients without a history of cardiovascular disease.[5] COVID-19 may induce cardiac injury, even without symptoms and signs of interstitial pneumonia.[10,11] Heart failure may be associated with new myocarditis due to COVID-19 infection, acute coronary syndrome or exacerbation of previously undiagnosed heart failure.[12,13] A series of end-stage heart failure patients with COVID-19 has been reported, providing strong evidence of myocardial injury caused by SARS-CoV-2.[9] COVID-19 viral myocarditis can have several clinical presentations, including life-threating arrhythmias or advanced heart failure requiring invasive support.[14] Furthermore, COVID-19 may increase metabolic demand and cause acute decompensation of pre-existing stable heart failure.[15]

WORSENING HEART FAILURE AND COVID-19

The possible reasons for the worsening of heart failure in COVID-19 infection include direct viral invasion to the heart, host response, inflammation-induced myocardial depression or stress cardiomyopathy.[16,17] Furthermore, in COVID-19 patients with ARDS and acute lung injury, right heart failure may induce further complications.[18,19] The angiotensin-converting enzyme 2 (ACE2) pathway is a critical pathway protecting against heart failure with preserved or reduced ejection fraction.[20] Heart failure patients have been found to have significantly increased myocardial ACE2 expression and to be more susceptible to heart infection by SARS-CoV-2, which may lead to further cardiac injury and a severe condition after infection.[4,21,22]

BIOMARKERS AND HEART FAILURE ASSOCIATED WITH COVID-19

Several studies have reported increased biomarker levels of myocardial injury in COVID-19 patients.[8,23,24] The elevation of these markers has been associated with increased disease severity and mortality.[6,24,25] These markers include creatine kinase MB subunit (CK-MB), high sensitivity cardiac troponin I (hs-cTnI), interleukin-6, B-type natriuretic peptide (BNP) and N-terminal pro-BNP (NT-proBNP).[8] About 27.5% of patients who have died from COVID-19 have been shown to have elevated levels of NT-proBNP.[8] Furthermore, 10% of these patients had increased cTnI levels.[8] The underlying mechanisms of myocardial injury may be related to inflammation, ACE2 expression, secondary to lung disease or drug toxicity.[8,21,26-28]

TREATMENT OF HEART FAILURE DURING THE COVID-19 PANDEMIC

In patients with heart failure during the COVID-19 pandemic, guideline-directed medical therapy should be continued with additional monitoring.[3] A previous study reported that ritonavir may worsen cardiovascular outcomes in patients with human immunodeficiency virus and heart failure.[29] Importantly, these data are not sufficient to restrict the use of lopinavir/ritonavir in patients with cardiovascular disease or heart failure given the life-threatening potential of COVID-19 and short-term duration of treatment.[3] However, lopinavir-ritonavir treatment has been shown to have no benefit in hospitalized adult patients with severe COVID-19.[30] Lopinavir/ritonavir can upregulate levels of beta-blockers, whereas chloroquine or hydroxychloroquine may downregulate levels of beta-blockers.[31] Lopinavir/ritonavir may affect angiotensin-converting enzyme inhibitors (ACEIs)/angiotensin receptor blockers (ARBs) and increase sacubitril/valsartan levels, which suggests that close monitoring of blood pressure is necessary.[3]

The positive effects of ACEIs/ARBs include ACE2 re-

ceptor blockade, disabling viral entry into the heart and lungs, and attenuation of inflammation.[32] However, ACEIs/ARBs may also upregulate ACE2 receptors by a possible retrograde feedback mechanism.[32] There is currently no evidence to suggest that ACEIs/ARBs should be discontinued due to COVID-19 infection.[3] Recent publications have shown that ACEIs/ARBs lowered the risk of all-cause mortality among hospitalized COVID-19 patients with hypertension.[33]

Digoxin levels should be closely monitored when co-administered with hydroxychloroquine, chloroquine or lopinavir/ritonavir. Eplerenone or ivabradine should not be used with lopinavir/ritonavir because both drugs are mainly metabolized by cytochrome P450 3A4 (CYP3A4).[3] However, spironolactone can be safely prescribed instead.[3] Nonsteroidal anti-inflammatory drugs (NSAIDs) may increase blood pressure and cause fluid retention and should not be used in patients with heart failure.[3]

CONSENSUS FOR THE MANAGEMENT OF HEART FAILURE DURING THE COVID-19 PANDEMIC

Given the lack of knowledge with regards to this new disease, we decided to develop a consensus document to address the management of heart failure during the COVID-19 pandemic.

Acute heart failure

Our mission for patients with heart failure with acute decompensation who need to be admitted to hospital is to avoid the spread of SARS-CoV-2 and improve the clinical condition of heart failure. We recommend the following to avoid the spread of SARS-CoV-2 in these high-risk patients:

- Early identification of the patients at high risk of contagion.
- Avoid the emergency room area if possible and direct admission to an isolation room if feasible.
- Early discharge and telephone follow-up if the clinical evolution of the patient is favorable.
- Patients with COVID-19 who have regularly used guideline-directed medical therapy for heart failure before infection should continue these medications if there are no contraindications. These medications include beta-blockers, mineralocorticoid receptor antagonists (MRAs), the I_f channel blocker, ACEIs, ARBs or the angiotensin receptor-neprilysin inhibitor (ARNI). However, the I_f channel blocker and/or the ARNI are not indicated for those with de novo heart failure with decompensation.
- Monitoring of the following biomarkers of myocardial injury are suggested in heart failure patients suspected or confirmed to have COVID-19: BNP or NT-pro BNP, troponin or high-sensitivity troponin I or T, procalcitonin, interleukin-6 or high-sensitivity C reactive protein.

Chronic heart failure

Because patients with heart failure have a higher risk of SARS-CoV-2 infection and the prognosis for patients with COVID-19 and heart failure is expected to be poor, it seems appropriate to limit hospital visits for stable heart failure patients during the epidemic. If feasible, hospital visits can be replaced by telephone follow-up:

- Guideline-directed pharmacological therapy for heart failure including beta-blockers, ACEIs, ARBs, the ARNI, MRAs and the I_f channel inhibitor should be continued even in those with COVID-19.
- Telemonitoring is suggested in patients with heart failure with fluctuating condition.
- Influenza or pneumococcus vaccine should be prescribed in patients with heart failure.
- Extend the duration of routine follow-up visits to prevent the spread of the SARS-CoV-2 epidemic
- Advise patients with heart failure to stay at home during the COVID-19 pandemic.
- Avoid alcohol or processed food consumption for patients with heart failure.
- Home-based exercise or rehabilitation is suggested for heart failure patients.
- Avoid delaying hospital visits if the symptoms worsen.
- Provide adequate psychological support for patients and caregivers.
- Provide home-based palliative care and hospice services if indicated.
- Virtual visits can be considered if the COVID-19 pandemic worsens in Taiwan.

Precautions that should be taken when performing an echocardiogram

Echocardiography can be a basic study in patients with SARS-CoV-2 infection and congestive heart failure, cardiomegaly, or arrhythmia. Performing this study is complex from the point of view of the protecting the echographer. Since it is impossible to keep a safe distance, an echocardiographic examination is considered to be one of the highest risks for healthcare professionals. We recommend the following:

- Use of gowns, shoe covers, gloves, N-95 facemasks, face shields and hair covers.
- Routine cleaning of the echocardiograph can be done with 70% alcohol solution.

CONCLUSIONS

The COVID-19 pandemic has had a strong impact on the management of heart failure. In acute heart failure, early identification of the patients at high risk of contagion and isolation is important. Guideline-directed medical therapy should be continued with additional monitoring. In patients with chronic heart failure, telemonitoring, influenza or pneumococcus vaccine, extending the duration of routine follow-up visits, home-based rehabilitation and staying at home are suggested during the COVID-19 pandemic. Because of the ongoing COVID-19 pandemic, this consensus for the management of heart failure reflects the present situation, and it may be updated in the future.

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CONFLICT OF INTEREST

All the authors declare no conflict of interest.

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