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A review on RAAS inhibitors may improve prognosis in hypertensive patients with COVID-19

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Abstract
Patient with hypertension and heart failure disease are at increased risk of severe corona virus disease 2019 caused by the SARS-CoV-2 virus, while also causing acute myocardial injury and chronic damage to the cardiovascular system. Angiotensin converting enzyme – 2 is a membrane bound aminopeptidase which is play an important role in heart function, development of blood pressure and immune systems and also has been identified as functional receptor for SARS CoV-2. The debate is for clinical use of angiotensin converting enzyme inhibitors and angiotensin receptor blockers in CVD and COVID-19 patients during the outbreak of novel corona virus.

Keywords: hypertension, SARS CoV-2, COVID-19, RAAS inhibitors

1. Introduction
In December 2019, on outbreak of acute respiratory syndrome like pneumonia caused by a novel corona virus which is occurred in wuhan, china [1]. The pathogen for the acute respiratory syndrome, originally called 2019 novel corona virus and the name was given after virus identification and isolation (2019 – nCoV) [2].
On 30 January 2020, the WHO declared the outbreak of SARS-CoV-2 a public health Emergency of International concern. Compared with the SARS-CoV that caused an outbreak of SARS in 2003, SARS-CoV-2 has a stronger transmission capacity. Because of high transmission capacity the prevention and control of COVID-19 is extremely serious [3].
Although the clinical manifestation COVID-19 is dominated by respiratory syndrome, some patients have severe cardiovascular damage [4]. Patient with hypertension and heart failure disease are at increased risk of severe corona virus disease 2019 caused by the SARS-CoV-2 virus [5].
Therefore, particular attention should be given to cardiovascular protection during treatment for COVID-19 and treatment of CVD [3].

2. Mechanism of actions of SARS-CoV-2 and ACE2
Angiotensin converting enzyme – 2 is a membrane bound aminopeptidase and aminopeptidase play an important role in heart and immune systems [6].
ACE2 is also participated in heart function and development of blood pressure and diabetes mellitus. In addition, ACE2 has been identified as functional receptor for SARS CoV and SARS CoV-2 [6]. The binding between spike protein of virus to the ACE2 and resulting SARS-CoV-2 infection carried out, which is expressed in heart and lungs [6]. Corona virus mainly enter in to the alveolar epithelial cells, which causing respiratory related symptoms. The respiratory symptoms are more serious in heart disease patients and secretion of ACE2 is more in cardiac patients than the normal person [3].

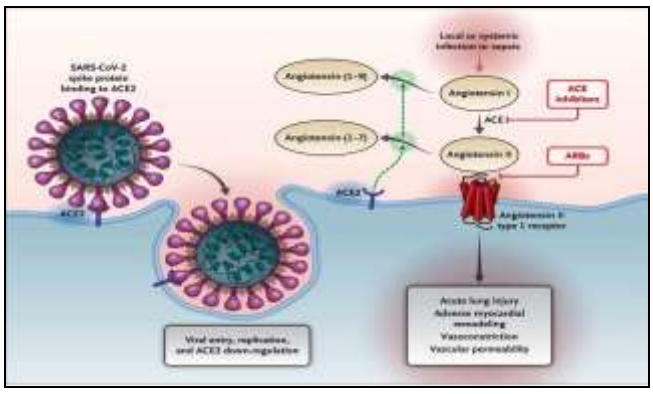

Fig 1: Mechanism of action of RAAS inhibitors[7]

By using rennin angiotensin aldosteron system inhibitors, increased the level of ACE2 and ACE2 is a functional receptor of SARS-Cov-2 [3].
In patient with COVID-19, the antihypertension therapy likes ACE inhibitor or angiotensin receptor blockers shown safely and potential effects which are carefully considered [3]. Whether patients with COVID-19 and hypertension who are taking an ACE inhibitor or angotensin receptor blocker should switch to another antihypertensive drug remains controversial [3].

3. Effect of COVID-19 on cardiovascular systems
The Middle East respiratory syndrome related corona virus (MERS-CoV) can cause acute myocarditis and heart failure even death will occur [8]. The pathogenecity of SARS-CoV-2 and MERS-CoV are mostly similar. The myocardial damage caused by infection with corona virus undoubtedly increase risk of difficulty and complexity of patient treatment [3].
According to study in Wuhan, china, blood pressure levels were significantly higher in COVID-19 patients treated in the ICU than in those not treated in the ICU [4]. The levels of biomarkers of myocardial injury were significantly higher in

patients treated in the ICU than in those not treated in the ICU [4].

National Health Commission of china (NHC) reported that, some of the patients first went to doctor because of cardiac symptoms like heart palpitations and chest tightness rather than respiratory syndrome like fever and cough but were later diagnosed with COVID-19 [3]. Therefore, in patients with COVID-19, the incidence of cardiovascular symptoms is more, owing to the systemic inflammatory response and immune system disorders during disease progression [3].

The pathogenicity of myocardial injury caused by COVID-19 might be related to ACE2 because ACE2 is highly expressed in lungs as well as in heart therefore ACE2 plays a important role in heart injury. Another proposed mechanism of myocardial damage is cytokine strom triggered by imbalance between T helper cells type I and type II [4, 9] and hypoxemia will occur and finally damage myocardial cells.

4. Preexisting CVD in COVID-19 patients:

MERS-CoV infection was more likely to occur in CVD patients [10]. In Patients with MERS-CoV infection and severe symptoms, 50% had hypertension and diabetes and up to 30% had heart disease. Similarly, according to the pneumonitis diagnosis and treatment program for new coronavirus infection, elderly people with comorbidities are more likely to be infected with SARS-CoV-2, especially those with hypertension, coronary heart disease or diabetes. Furthermore, CVD patients account for a large proportion of deaths from COVID-19 [3].

According to NHC more than 60 years aged patients suffering from more SARS-CoV-2 systemic symptoms than the patients below 60 years aged [11].

Patients with acute coronary syndrome (ACS), who are infected with SARS-CoV-2 often have a poor prognosis and reducing owing to myocardial ischemia or necrosis and patient leads to sudden deterioration [3].

5. CVD and treatment of hypertension with COVID-19 patient

In particular, the use of antiviral drug should be monitored. However, many antiviral drugs can cause cardiac insufficiency, arrhythmia or other cardiac disorders. Therefore, during treatment of COVID-19, with use of antiviral drugs may be higher risk of cardiac toxicity must be closely monitored [12].

In current guideline shown that recommended patient with hypertension should continue taking antihypertensive medications without interruption [5]. In a new review, a group of scientists in spain, Italy and the united states seek to address the controversy [5]. After looking in many published studies, no study says that or confirmed that increase in circulating ACE2 levels or expression would not necessarily imply an increased risk of infection or disease severity [5].

Angiotensin II is responsible for vasoconstriction fibrosis, inflammation etc. So, it is helpful that drugs can inhibit the production of angiotensin II could actually be very useful and beneficial to systemic health and lung injury also [5].

So, current evidence indicates that RAAS inhibitors significantly reduce mortality in cardiovascular disease, reduce the progression of chronic kidney disease and the treatment of hypertension and heart failure [5]. ACEIs or ARBS thereby should be monitored or initiated, as indicated in patient regardless of COVID-19 [5]. The use of ACEIs sometimes associated with cough as a side effect and withdrawal side effects rates of ARBs are much lower. So, the ARBs could potentially be more favourable treatment option in COVID-19 patients at higher risk of developing severe form of the disease.

6. Conclusion

Patients suffering from CVD and COVID-19 might have an increased risk of death because secretion of ACE2 in CVD patients and hypertensive patients taking RAAS inhibitors may increase the level. Still now, no any reported documented evidence of risk for using ACEIs and ARBs and current guidelines suggest that there is no need to change antihypertensive medications without interruption. So, now a day RAAS inhibitors could potentially more favorable treatment option for hypertensive patients and CVD patients with covid-19 infection may improve prognosis.

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