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Cardiac injury is independently associated with mortality irrespective of comorbidity in hospitalized patients with coronavirus disease 2019

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Coronavirus disease 2019 (COVID-19) has become a global pandemic and an unexpected public health crisis [1]. Although respiratory symptoms are common clinical manifestations of COVID-19, some patients will experience cardiovascular (CV) complications [1, 2]. Many previous studies have been reported that pre-existing CV diseases (CVD) and in-hospital myocardial injury are both key determinants of COVID-19 mortality [2]. Moreover, COVID-19 related cardiac injury occurs more frequently in patents with pre-existing CV comorbidities [3]. However, whether the increased mortality in patients with cardiac injury can be attributed to a higher prevalence of comorbidities in COVID-19 patients remains unclear.

In this issue of "Cardiology Journal", Lorente-Ros et al. [4] described the associations between cardiac injury and mortality in COVID-19 patients, and whether this link was related to patient comorbidities. Between March 18 and March 23 in 2020, 707 consecutive adult patients admitted to a large tertiary hospital with confirmed COVID-19 were retrospectively included. The demographic data, medical history, laboratory results and clinical outcomes were gathered, and the Charlson comorbidity index (CCI) was calculated to quantify the degree of comorbidities. COVID-19 associated cardiac injury is defined if the level of serum cardiac troponin (cTn) I/T increase is above the 99th percentile upper reference limit after excluding obstructive coronary artery disease [2, 5]. The results showed that 20.9% of COVID-19 patients presented with cardiac injury [4]. This finding is similar with previous findings in Wuhan, China [6–8]. In the multivariate-adjusted Cox proportional hazard regression model, cTnI, age, C-reactive protein and creatinine on admission were independently associated with a higher risk of all-cause mortality within 30 days [4]. In a second Cox model, adjusted for CCI to account for age and comorbidity, cTnI was also proved as the independent indicator associated with higher risk of mortality (hazard ratio 2.31, 95% confidence interval 1.57–3.39, $p < 0.001$) in COVID-19 [4]. Thus, cardiac injury is independently associated with mortality irrespective of baseline comorbidities. And the addition of cTnI to multivariate regression models significantly improves their performance in predicting mortality in a time-dependent receiver operating characteristic curve [4].

In another study, Cao et al. [9] included 244 COVID-19 patients with no pre-existing CVD, and revealed that 11% of these patients had increased cTnI levels (> 40 ng/L) on admission. And serum cTnI levels provided independent prediction to both disease severity and 30-day in-hospital mortality in these COVID-19 patients with no prior

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CVD [9]. It further indicated that myocardial injury is an independent predictor for mortality irrespective of CV comorbidities in COVID-19.

Based on the predictive value of troponin to mortality, the determination of cardiac injury biomarkers on admission and its combination with CCI can classify patients into three risk groups (high, intermediate and low), which may shed important light on the clinical management of COVID-19. The elevation of troponin may be interpreted as an early warning sign with aggravating the disease, identifying those patients who might require careful monitoring. Not only that, aggressive cardioprotective treatments could be applied to COVID-19 patients with cardiac injury in a timely manner.

Circulating cardiac troponin is a marker of cardiac injury, including but not limited to myocarditis or myocardial infarction. Potential mechanisms of myocardial injury in COVID-19 include viral myocarditis induced by virus infection and autoimmune response, coronary microvascular ischemia mediated by endothelia cell dysfunction, stress cardiomyopathy and tachyarrhythmia attributable to adrenergic stimulation, atherothrombosis triggered by the proinflammatory and prothrombotic state, and myocardial oxygen supply or demand imbalance with hypoxia, hypotension, or tachycardia [10]. Thus, myocardial injury can occur independently or on the basis of comorbidity in COVID-19.

Treatments for myocardial injury in COVID-19 mainly refer to anti-viral therapy and anti-inflammatory therapy. Since the outbreak of COVID-19, a few anti-virus agents have been proposed. Among them, the most hopeful one is remdesivir. In the randomized controlled trial (RCT) of COVID-19, remdesivir did not show obvious clinical benefit for severe COVID-19 patients [11]. Although no antiviral drugs have been proved to be effective by RCT, several drugs may have certain therapeutic effects after clinical observation. In the Chinese management guidelines for COVID-19, interferon-α, ribavirin, chloroquine phosphate and abidol could be recommended [12]. For anti-inflammatory drugs, corticosteroid could be the first one shown to reduce the mortality of COVID-19 patients [2]. Also in the Chinese management guideline for COVID-19, patients with progressive hypoxia, rapid progress in lung imaging, and excessive inflammatory response are advised to use glucocorticoid within a short time [12]. The other anti-inflammatory or immunomodulation therapies such as intravenous immunoglobulin, anti-interleukin-6 receptor monoclonal antibody, convalescent plasma, blood purification, mesenchymal stem cell infusion, among others have also proved to be effective in a portion of COVID-19 patients [12]. For severe and critical COVID-19 patients with cardiac injury, it is necessary to carry out respiratory and circulatory support treatment such as mechanical ventilation, continuous renal replacement therapy, and extracorporeal membrane oxygenation.

COVID-19 patients with pre-existing medical conditions are susceptible to cardiac injury. However, myocardial injury is an independent predictor for mortality, irrespective of comorbidity in COVID-19. The management of myocardial injury in COVID-19 is of great importance and should be continuously improved in future research.

Conflict of interest: None declared

References

1. Nishiga M, Wang DW, Han Y, et al. COVID-19 and cardiovascular disease: from basic mechanisms to clinical perspectives. Nat Rev Cardiol. 2020; 17(9): 543–558, doi: 10.1038/s41569-020-0413-9, indexed in Pubmed: 32690910.
2. Wei ZY, Geng YJ, Huang Ji, et al. Pathogenesis and management of myocardial injury in coronavirus disease 2019. Eur J Heart Fail. 2020 [Epub ahead of print], doi: 10.1002/ejhf.1967, indexed in Pubmed: 32683753.
3. Guan Wj, Liang Wh, Zhao Yi, et al. Comorbidity and its impact on 1590 patients with COVID-19 in China: a nationwide analysis. Eur Resp J. 2020; 55(5): 2000547, doi: 10.1183/13993003.00547-2020.
4. Lorente-Ros A, Monteagudo Ruiz JM, Rincón LM, et al. Myocardial injury determination improves risk stratification and predicts mortality in COVID-19 patients. Cardiol J. 2020; 27(5): 489–496, doi: 10.5603/CJ.a2020.0089, indexed in Pubmed: 32589258.
5. Thygesen K, Alpert JS, Jaffe AS, et al. Fourth Universal Definition of Myocardial Infarction (2018). J Am Coll Cardiol. 2018; 72(18): 2231–2264, doi: 10.1016/j.jacc.2018.08.1038, indexed in Pubmed: 30153967.
6. Zhou F, Yu T, Du R, et al. Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study. Lancet. 2020; 395(10229): 1054–1062, doi: 10.1016/S0140-6736(20)30566-3, indexed in Pubmed: 32171076.
7. Shi S, Qin Mu, Shen Bo, et al. Association of cardiac injury with mortality in hospitalized patients with COVID-19 in Wuhan, China. JAMA Cardiol. 2020; 5(7): 802–810, doi: 10.1001/jamacardio.2020.0950, indexed in Pubmed: 32211816.
8. Nie SF, Yu M, Xie T, et al. Cardiac troponin I is an independent predictor for mortality in hospitalized patients with COVID-19. Circulation. 2020; 142(6): 608–610, doi: 10.1161/CIRCULATIONAHA.120.048789, indexed in Pubmed: 32539541.
9. Cao J, Zheng Y, Luo Z, et al. Myocardial injury and COVID-19: Serum hs-cTnI level in risk stratification and the prediction of 30-day fatality in COVID-19 patients with no prior cardiovascular disease. Theranostics. 2020; 10(21): 9663–9673, doi: 10.7150/thno.47980, indexed in Pubmed: 32863952.
10. Chapman AR, Bularga A, Mills NL. High-Sensitivity cardiac troponin can be an ally in the fight against COVID-19. Circulation. 2020; 141(22): 1733–1735, doi: 10.1161/CIRCULATIONAHA.120.047008, indexed in Pubmed: 32251612.
11. Wang Y, Zhang D, Du G, et al. Remdesivir in adults with severe COVID-19: a randomised, double-blind, placebo-controlled, multicentre trial. Lancet. 2020; 395(10236): 1569–1578, doi: 10.1016/s0140-6736(20)31022-9.
12. National Health Commission of the People's Republic of China. Chinese management guideline for COVID-19 (version 8.0). August 19, 2020. http://www.nhc.gov.cn/yzygj/s7653p/202008/0a7bdf12bd4b46e5bd28ca7f9a7f5e5a/files/a449a3e2e2c94d9a856d5faea2ff0f94.pdf (accessed Aug 19, 2020; in Chinese).