

## Peer Review File

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### Reviewer A

There are many grammatical flaws in this paper. There are also many blanket statements, that are mere assumptions or observations, with no supporting evidence. The assumption that RRT reduces mortality in Covid -19 patient is unsubstantiated. The criteria in this study for who was offered RRT were also not standardized or discussed, leaving open the possibility that the sickest patient was not offered RRT while those with a better prognosis were. There is also paucity of data on the use of ECMO or IABP in Covid-19 associated shock and at most centers, Covid-19 infection itself would be a contraindication for MCS. There was no detailed discussion on the criteria used to initiate MCS or why one strategy (IABP vs. ECMO) was chosen over the other. Finally, it is well documented that IABP and ECMO are not equal in the realm of MCS and thus placing both under the same umbrella of MCS is an inherent flaw of this paper.

Reply : We thank reviewer for carefully reading our manuscript and the suggestions. We have carefully corrected these mistakes in the revised manuscript and now it should be much better. Also, the language editorial help to correct our manuscript. This is a retrospective study. We cannot assumption that RRT reduces mortality in COVID -19 patients. In our study, we aimed to describe the clinical characteristics, management and outcomes of critically ill COVID-19 patients rescued by mechanical circulatory support. However, we added the criteria for who was offered CRRT in the revised manuscript (see page 9, line 1-11).

We agree with the reviewer. You are right ! In fact, up to now, no any experience or evidence to support the use of MCS in Covid-19 patients. We found MCS implementation should precede at the onset of multiple organ dysfunction syndrome induced by respiratory failure, hypoxemia and inflammatory storm, instead of a salvage therapy. We have discussed these points in the discussion section. Indeed, the treatment of Covid-19 requires collaboration of Multi-disciplinary Team. Modulation of viralmediated and immune-mediated myocardial injuries or both might be an essential target to improve the clinical outcome in Covid-19 patients requiring acute MCS treatments. We also discussed several limitations of this study in the discussion section.

### Reviewer B

This paper is one of the first studies evaluating factors predicting successful weaning and survival after implementation of Mechanical Circulatory Support (MCS) in a cohort of COVID-19 patients. Respiratory failure with implementation of short term

MCS, inflammation markers, myocardial injury and renal replacement therapy highlight as reliable markers of weaning from MCS and survival.

Strengths of the paper:

1. One of the first studies of clinical characteristics of COVID patients supported with MCS predicting ECMO weaning and patient's survival
2. Reproducible and easily measured laboratory variables in the everyday clinical practice that could contribute to the practical evaluation of the clinical status, risk assessment and patient selection of ECMO in this patient population
3. Well elaborated and detailed tables and figures of the observational findings and results of the study

Reply : Thank you very much for carefully reading and positively commenting our manuscript.

Weaknesses - opportunities for improvement

1. Small number of patients included in the study cohort as the enrollment period was very short.

Reply : We appreciate the reviewers' comments. This is an observational study, we cannot draw clear cause-and-effect between laboratory findings, treatments and mortality of Covid-19 patients. We also discuss the limitations of this study in the discussion section.

2. The authors need to specify what type of MCS support was implemented: VV ECMO or VA ECMO?

Reply : We appreciate the reviewers' comments and suggestions. We provided the information of ECMO according your suggestion. Please refer to Table 3.

3. The authors are not clear if the cohort of patients enrolled was in respiratory failure or/and in cardiogenic shock requiring different approach of MCS. What was their diagnosis at presentation and criteria for MCS implementation? If both strategies, VV or VA ECMO, were used, what was the outcomes of the two different group of patients?

Reply : The patients with mechanical circulatory support were diagnosed as having Covid-19 and classified as critically ill according to the Guidance for Corona Virus Disease 2019 (7th edition) released by the National Health Commission of China. Please refer to the page 6, line 15-22. We also provided the outcomes of the two different group of patients (VV or VA ECMO). Please refer to Table 3.

4. What cannulation and access strategies were implemented and did these strategies affect survival/outcomes?

Reply : We appreciate the reviewer' suggestion, which raise an important issue. We reanalysis the cannulation and access strategies and found these strategies do not affect

outcomes. Please refer to Table 3.

5. How did the timing and type of drug therapy affect outcomes? Did Traditional Chinese Medicine impact survival or other outcomes?

Reply : We appreciate the reviewer's suggestion, which raise an important issue. In our study, Table 1 summarized the therapy strategies and we found these factors did not affect outcomes. We also reanalyzed the effect of Traditional Chinese Medicine and came to the same conclusion. Please refer to Table 1.

6. The authors could elaborate on the suspected beneficial mechanisms of CRRT in the favorable impact in the survivors group? What were the criteria of implementation? Was CRRT implemented to treat Acute Kidney Injury (AKI) /uremia or was it employed to manage fluid overload and maybe the inflammatory response?

Reply : We appreciate the reviewer's suggestion. Excessive myocardial injury, release of inflammatory cytokines and inflammatory storm are important clinical determinants of Covid-19. The advantages of CRRT in the treatment of COVID-19 were as follows : (1) Correct and maintain the water, electrolyte, and acid-base balance, maintain the stability of the internal environment, and provide life support; (2) Remove toxic substances such as metabolites; (3) Exert effective treatment for volume overload; (4) Effective control of high fever; (5) Improve the inflammation, endothelial function, and immune status. Therefore, the rational application of CRRT might be beneficial to the treatment of critically ill patients and reduce mortality. We have added this information in the revised manuscript. Please refer to the Discussion section.

7. Is increased serum level of TnI and the definition of acute myocardial injury proposed in the paper correlates with clinical presentation of cardiogenic shock requiring the use of IABP/VA ECMO for circulatory support vs respiratory MCS type? (VV vs VA ECMO?). Or is it just used as a marker of myocardial injury?

Reply : This is an important issue and we are sorry for our poor description of the paper. In this study, increased serum level of TnI just used as a marker of myocardial injury.

8. The English language of both the Abstract (especially the results section) and the main manuscript could be significantly improved

Reply : We thank reviewer for carefully reading our manuscript and the suggestions. We have carefully corrected these mistakes in the revised manuscript and now it should be much better. Alao, the language editorial help to correct our manuscript.

9. In the conclusions, please emphasize more the predictors and findings that were identified from the multivariate analysis (Table 4)

Reply : This is an important issue and we thank the reviewer for this suggestion. We have emphasized these points in the revised manuscript.

10. Along the same lines in Figure 1 it will be better to include a few of the variables that were identified in Table 4 (lactate, CRP, BNP, pH)

Reply : We appreciate the reviewers' comments and suggestions. We have provided these information in the revised manuscript. Please refer to Fig.2.