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Microcirculation in cardiogenic shock supported with extracorporeal membrane oxygenation: the need for a homogeneous population and strict evolution assessment

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See related research by Yeh et al., https://ccforum.biomedcentral.com/articles/10.1186/s13054-018-2081-2

We read with great interest the article by Yeh et al. about microcirculation in cardiogenic shock supported by venoarterial extracorporeal membrane oxygenation (VA ECMO) [1]. We would like to commend the authors for their efforts to shed some light on this promising field. However, we would like to comment on several points.

The heterogeneity of cardiogenic shock (CS) etiologies and its complex pathophysiology requires the thorough study of selected populations, especially when studying microcirculation. The inflammatory component in CS pathophysiology has become increasingly acknowledged [2] and it may vary significantly depending on its etiology. The authors did not specify the causes of heart failure and, most importantly, half of the patients included in each group were patients who received ECMO for refractory cardiac arrest (E-CPR). Such patients usually present with systemic inflammation response syndrome and thus have important endothelial dysfunction, inflammation, and vasoplegia. In fact, post-cardiac arrest patients have intrinsic impaired sublingual microcirculation [3]. In our opinion, the heterogeneity of the studied population makes it difficult to interpret the outcomes related to microcirculation.

The authors outlined the usefulness of early microcirculatory parameters in predicting 28-day mortality in CS shortly after VA ECMO implantation [1]. They found a well-known lack of relationship between microcirculation and macrocirculation in CS [4]. However, the microcirculatory assessment was performed only after VA ECMO implantation, with no information about the pre-ECMO macro- and microcirculation situation. Thus, we wonder if the worse outcome may also have been due to a profound pre-ECMO microcirculation impairment not sufficiently restored by VA-ECMO despite global hemodynamic normalization. In our opinion, further studies on the microcirculation in CS should specifically assess microcirculation prior to ECMO implantation.

Finally, as almost 50% of CS patients are known to die despite having restored cardiac output [5], it would have been interesting to report the number of non-surviving patients eventually weaned off ECMO and the leading causes of death (multiorgan failure, cerebral anoxia, septic shock, etc.), especially when including such a large population of E-CPR. Along this line, an interesting primary outcome for future studies might be the success of weaning off VA ECMO instead of global 28-day mortality.

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Authors' response

Yu-Chang Yeh, Ya-Jung Cheng and Yih-Sharng Chen

We thank Montero et al. for their comments regarding our article investigating the microcirculation in patients with VA-ECMO life support [1]. First, we agree that the mechanism of microcirculatory dysfunction and its effects on mortality might vary in different primary etiologies of cardiogenic shock; therefore, we mentioned it as the first limitation of our article. Further cooperation in a multicenter trial may help to increase the sample size to answer this question. Second, we agree about the importance of information on the pre-ECMO microcirculation. In daily clinical practice, however, most VA-ECMO placements may occur unexpectedly, in emergency situations, or outside the working hours of research assistants. Further research may be designed to investigate the pre-ECMO microcirculation before elective VA-ECMO placement for cardiogenic shock. Third, the leading causes of death in the 28-day non-survivors were septic shock (29%), postanoxic brain damage (25%), multiorgan failure (25%), and refractory cardiogenic shock (21%). Finally, we agree with Montero et al. that further studies may investigate primary outcomes related to successful weaning from VA-ECMO. We recommend referring to the study of Akin et al. that identified sublingual microcirculation as a novel potential marker for successful weaning from VA-ECMO [6]. It is time-consuming and labor-intensive to investigate microcirculation in VA-ECMO patients, and we need more resources to support VA-ECMO trials. Let us hope that further cooperation in a multicenter trial may help to increase the sample size and power to answer important questions concerning VA-ECMO patients.

Abbreviations

CS: Cardiogenic shock; ECMO: Extracorporeal membrane oxygenation; E-CPR: ECMO for refractory cardiac arrest; VA ECMO: Venoarterial ECMO

Authors' contributions

SM, JC, GF, AC, and MS wrote, and approved the final manuscript.

Ethics approval and consent to participate

Not applicable.

Consent for publication

Not applicable.

Competing interests

Pr Combes has received honoraria for lectures by GETINGE. Dr. Schmidt has received honoraria for lectures by GETINGE and DRAGER. The other authors do not report any potential competing interests.

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