

LETTER

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# Is the 77.1 % rate of in-hospital mortality in patients receiving venoarterial extracorporeal membrane oxygenation really that high?

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See related research by Aso et al., <http://ccforum.biomedcentral.com/articles/10.1186/s13054-016-1261-1>

Aso and colleagues concluded that a nationwide study showed 'high mortality rates' in patients who received venoarterial extracorporeal membrane oxygenation (VA-ECMO), particularly in those with cardiogenic shock and cardiac arrest [1]. They stated that in-hospital mortality in these patients was 77.1 %. We believe that some comparisons should be made to determine whether the mortality rate is really that high.

ECMO, especially percutaneous cardiopulmonary support (PCPS), has been used extensively in emergency medicine and surgery as a simple but powerful device since 1987 in Japan [2]. Emergency cardiopulmonary support has been used in a variety of emergency cases and improved resuscitation. Maekawa et al. reported that, in a propensity-matched study of 162 out-of-hospital cardiac arrest patients, neurologic outcome in the extracorporeal cardiopulmonary resuscitation (CPR) group was improved compared with that in the conventional CPR group. In this study, CPR duration averaged 49 min, the ICU survival rate was 95.8 %, and the cerebral performance category status 1 or 2 at 3 months was 29.2 % [3]. This device has a beneficial effect on out-of-hospital cardiac arrest patients.

In the in-hospital cardiac arrest setting, Chen et al. reported that, in a propensity analysis of 113 cardiac arrest patients, extracorporeal CPR resulted in a higher survival rate to discharge than conventional CPR (28.8 % versus 12.3 %) [4]. Shin et al. reported that, in a propensity score matching analysis of 90 patients with cardiogenic cardiac arrest, in-hospital survival was higher with extracorporeal CPR (35.5 % versus 8.8 %) [5]. These reports suggested that in-hospital cardiac arrest 'survival rates' are around 10–20 % even in the hospital where extracorporeal CPR could be used. In the Aso et al. report [1], the 'mortality' of cardiac arrest patients in cardiogenic shock was 77.1 %. This percentage also included out-of-hospital cardiac arrests, so the in-hospital cardiac arrest mortality could be lower. Furthermore, physicians mostly use ECMO as a last-ditch measure because this procedure may have lethal adverse vascular effects and is very expensive. Even in such a critical situation, about one quarter of the patients survived to discharge in this nationwide database. From the viewpoint of physicians, this mortality rate does not appear high. These results could suggest that VA-ECMO may be a potential therapy for in-hospital cardiac arrest patients.

## Authors' response

Shotaro Aso and Hideo Yasunaga

We thank Dr. Shimizu and Dr. Ogura for their insightful comments. As they pointed out, the eligible patients in our study included out-of-hospital and in-hospital cardiac arrest

patients, and the reported mortality rate (77.1 %) may be higher than that for in-hospital cardiac arrest patients alone. We agree that physicians mostly use VA-ECMO as a last-ditch measure. The aim of the present study was to clarify the current status of cardiac arrest patients treated with VA-ECMO using a national inpatient database. A previous review reported that the in-hospital mortality rate

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of cardiogenic shock patients with cardiac arrest varied widely, ranging from 6 % to 59 %, because of differences in population selection [6]. The previous studies cited by Dr. Shimizu and Dr. Ogura are limited because of their small sample sizes from single centers [3–5]. Our data were based on a national database that covers approximately 92 % of all tertiary-care emergency hospitals in Japan. Therefore, our results are more reliable than those in the previous studies.

We agree with Dr. Shimizu and Dr. Ogura that VA-ECMO may be a potential therapy for in-hospital cardiac arrest patients. However, the present study did not provide any evidence on the effectiveness of VA-ECMO because of the lack of a control group.

Dr. Shimizu and Dr. Ogura commented that “from the viewpoint of physicians, this mortality rate does not appear high.” However, we do not believe that this rate is low. The discrepancy may simply depend on differences in our senses of values. We believe that the important point is to acknowledge that there is much room for improvement in this rate, and again we would like to emphasize that further studies are needed to investigate the effects of VA-ECMO.

#### Abbreviations

CPR, cardiopulmonary resuscitation; ECPR, extracorporeal cardiopulmonary resuscitation; PCPS, percutaneous cardiopulmonary support; VA-ECMO, venoarterial extracorporeal membrane oxygenation

#### Authors' contributions

KS and HO designed the manuscript, participated in drafting it, and approved the final version.

#### Competing interests

The authors declare that they have no competing interests.

Received: 11 May 2016 Accepted: 2 June 2016

Published online: 15 July 2016

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