

VERIFICATION OF HEMOLYSIS RISK FACTOR BY PLASMA FREE HEMOGLOBIN  
MEASUREMENT DURING LONG-TERM EXTRACORPOREAL LIFE SUPPORT

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ABSTRACT

<Background> One of the problems with long-term extracorporeal life support (ECLS), such as extracorporeal membrane oxygenation (ECMO) and centrifugal pump left ventricular assist device (LVAD), is hemolysis. Hemolysis can cause acute kidney injury (AKI). According to the Extracorporeal Life Support Organization (ELSO) ECMO guidelines, plasma free hemoglobin (PFHb) should be controlled below 0.01 g/dL as an indicator of hemolysis, and above 0.05 g/dL if PFHb exceeds 0.05 g/dL, the cause of the disease should be investigated. There are few reports on PFHb in ECLS in Japan. Therefore, in this study, PFHb measured during long-term extracorporeal life support was used to verify the risk of hemolysis occurrence.

<Methods> Forty-five pediatric cases (ECMO: 44, LVAD: 1) from November 2017 to March 2022 were included in the study, in which PFHb were measured to evaluate hemolysis during ECLS. Results were compared with PFHb <0.03 g/dL as "no hemolysis (16 patients: 35.6%)" and PFHb >0.03 g/dL as "hemolysis (29 patients: 64.4%)".

<Results and Discussion> The mean duration of ECMO in the group without hemolysis was  $2.49 \pm 1.13$  days, and in the group with hemolysis,  $14.4 \pm 24.7$  days, indicating that the longer duration of ECMO was involved as a hemolytic factor. The median time of confirmed hemolysis was 42.5 hours for mild hemolysis, 94.1 hours for moderate hemolysis, and 449.9 hours for severe hemolysis. The severity of hemolysis was suggested to increase with the duration of ECMO. One LVAD patient was mildly hemolyzed at 281.6 hours, avoiding hemolysis longer than the ECMO case group. Compared to ECMO, LVAD appeared to be associated with a lower risk of hemolysis.

<Conclusions> Severe hemolysis is associated with risk of AKI and death. Therefore, appropriate selection of devices should be considered to avoid hemolysis and treatment strategies aimed at weaning the patient off ECMO as soon as possible should be considered.