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Editorial

Not Alternative, But Additional Use of Extracorporeal Membrane Oxygenation in Patients with Life-Threatening Pulmonary Thromboembolism

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▸ See the article "In-Hospital Outcome in Patients Underwent Extracorporeal Membrane Oxygenation in Life-Threatening High-Risk Pulmonary Embolism" in volume 2 on page 187.

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Right ventricular (RV) afterload significantly increases with the degree of pulmonary thromboembolic burden. Thin-walled, compliant RV cannot unload sufficiently resulting in dilatation and drastic decrease in stroke volume. The dilated RV pushes the interventricular septum toward the left ventricle (LV), resulting in decreased LV output as well. Afterload is further worsened when hypoxia causes localized vasoconstriction by stimulating the release of vasoactive mediators.[1)2)] The mortality of PE is closely related to the degree of RV failure and hemodynamic instability.[3)4)] Therefore, early intervention to reduce RV afterload is key to increase survival rate in high risk pulmonary thromboembolism.

Mechanical circulatory support, mostly with veno-arterial extracorporeal membrane oxygenation (VA-ECMO) reduces RV preload, resulting in improving RV cardiac output.[5)] It also increases LV output by improving interventricular septal bowing, finally, restores tissue oxygenation. Theoretically extracorporeal membrane oxygenation (ECMO) could be considerably useful, but the evidence is not supported., The recent guideline suggests a usefulness of ECMO in patients with high-risk pulmonary thromboembolism (PTE), and circulatory collapse or cardiac arrest as class IIb indication.[6)] In the previous reports in early 2000s, in-hospital mortality of high-risk PTE patients treated with ECMO was about 40%.[7)8)] Recent studies reported longer outcomes with variable survival; 53% of ninety-day mortality[9)] or 61.5% of 30-day mortality.[10)] In the present study, in hospital mortality was 51.5%.[11)] With advance in ECMO and introduction of revised guidelines, this might be due to extended administration of ECMO in patients with more severe presentation when experienced ECMO team is available.

In high risk PTE, VA-ECMO can be used in 2 different scenarios 1) bridge to recovery in patients receiving heparin or thrombolytic therapy; and 2) bridge to embolectomy.[5)] In the study of Ghoreishi et al.[12)] with 41 massive PTE treated with VA-ECMO, 73% responded anticoagulation alone and showed 97% of 90-day survival, which was comparable with 100% survival in patients treated with surgical embolectomy.[12)] In the present study, in-hospital mortality was lower in anticoagulation only group (35.7%) compared to thrombolysis (60.0%) or mechanical PTE removal group (66.7%). However, other study including 52 patients with high-risk PTE treated with ECMO reported lower 30-day mortality with surgical embolectomy (29.4%) compared with other treatment modalities (fibrinolysis: 76.5%, no

reperfusion therapy: 77.7%).[10] Considering small sample size of all data, more studies are needed to find out which patients would survive without reperfusion therapy in high-risk PTE treated with ECMO. As of now, ECMO considered to be useful only in combination with surgical embolectomy or catheter-directed treatment.[6]

Short term assessment of RV function in high-risk patients treated with ECMO might predict need for rescue reperfusion therapy. In the aforementioned study of Ghoreishi et al.,[12] massive PTE patients were treated with ECMO and RV function was assessed 3 to 5 days after ECMO insertion with echocardiography. Factors related to the chronicity of thrombus such as prolonged shortness of breath, elevated NT- pro-BNP, enlarged pulmonary artery diameter, and history of venous thromboembolism were associated with the need for surgical pulmonary embolectomy.[12]

VA-ECMO could be a lifesaving rescue therapy for patients with high-risk, acute, massive PTE. However, use of ECMO is associated with a high incidence of complications as shown in the present study (66.7%). Thus, it is important to utilize VA-ECMO for the minimal duration necessary to accomplish the bridge to either recovery or more invasive intervention. Future studies should investigate which patients would need for additional mechanical clot-removal therapies or would survive with anticoagulation only therapy.

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