

인공호흡기와 승압제에 반응하지 않는 호흡 부전 및 쇼크를 동반한 중증 패혈증 환자에서 extracorporeal membrane oxygenation (ECMO)과 continuous veno-venous hemofiltration (CVVH) 병용 요법의 치료효과

한림의대 신장내과 신장연구소¹, 순환기내과², 흉부외과³

최명진¹ · 김형수³ · 한상진² · 윤종우¹ · 이영기¹ · 송영림¹ · 김수진¹ · 박태진¹ · 구자룡¹

Combined use of Extracorporeal Membrane Oxygenation (ECMO) and Continuous Veno-venous Hemofiltration (CVVH) for Refractory Respiratory and/or Circulatory Failure in life-threatening Sepsis

Choi Myung-Jin¹, Kim Hyung-Soo³, Han Sang-Jin², Yoon Jong-Woo¹
Lee Young-Ki¹, Song Young-Lim¹, Kim Soo-Jin¹, Park Tae-Jin¹, Koo Ja-Ryong¹

Hallym University Hospital Division of Nephrology Kidney Research Institute¹, Cardiology², Chest Surgery³

Background: Severe sepsis or septic shock is nearly fatal, especially in patients with refractory respiratory and/or circulatory failure unresponsive to optimal standard therapy. ECMO might provide the potential benefits of improving organ perfusion and oxygenation in sepsis patients with refractory hypoxia or circulatory collapse via introduction of an artificial oxygenator and circulation of blood by either veno-venous or veno-arterial pump-driven support. However, ECMO could not manage fluid overload and has been shown to increase inflammatory cytokines, which could aggravate sepsis induced organ damage. In contrast, CVVH could be beneficial in the treatment of sepsis by management of fluid balance and modulation of inflammatory mediators of sepsis. Therefore, in this pilot study, we evaluated the effect of combined use of ECMO and CVVH for refractory respiratory and/or circulatory failure in life-threatening sepsis.

Method: ECMO (maximum flow, 4.6 ± 0.7 L/min) and CVVH (ultrafiltration rate, 2000 mL/hr) were applied concomitantly in 10 severe sepsis or septic shock patients (49 ± 18 yr; male, $n=9$) with ventilator unresponsive hypoxia ($n=4$, veno-venous ECMO) or vasopressor unresponsive shock ($n=6$, veno-arterial ECMO). Patients with terminal cancer and irreversible major organ damage were excluded from the study.

Results: The mean APACHE II score was 33.4 ± 5.4 with expected mortality of $77 \pm 11\%$. Eight patients were successfully weaned from the ECMO, and 5 of them survived to discharge. Overall survival rate was significantly higher than expected survival rate based on APACHE II score (50% versus 23%, $p=0.042$, nonparametric chi-square test). The mean duration of ECMO was 9.3 ± 6.3 days and the mean ICU stay was 35 ± 26 days. In one patient, low extremity ischemic necrosis was developed as a possible complication of arterial cannulation.

Conclusion: In sepsis patients with ventilator unresponsive hypoxia or vasopressor unresponsive shock, combined use of ECMO and CVVH was associated with increased overall survival. In severe sepsis or septic shock patients with refractory respiratory and/or circulatory failure, survival could be improved by combined use of ECMO and CVVH. Further prospective or large-scale studies are required.

Key Words: 패혈증, 체외막산소화, 혈액여과
Sepsis, ECMO, CVVH