ibility and safety results of LAAO in hemodialysis patients and its long-term efficacy has not been investigated.

The current study offers an initial insight into this clinical problem, by providing long-term follow-up data, which is essential to assess the efficacy of LAAO at preventing thromboembolic events in this very high-risk population.

The present analysis suggests that LAAO could be a safe and effective procedure in hemodialysis patients, in which it may be a reasonable alternative to oral anticoagulation. Nevertheless, careful attention to baseline comorbidities prior to indication of LAAO is of the utmost importance in this population, and further randomized trials are warranted.

CONFLICTS OF INTEREST

I. Cruz-González is proctor for Abbot Vascular. No other conflicts of interest exist.

Ignacio Cruz-González,[a] Blanca Trejo-Velasco,[a,*] María Pilar Fraile,[b] Manuel Barreiro-Pérez,[a] Rocío González-Ferreiro,[a] and Pedro Luis Sánchez[a]

[a]*Departamento de Cardiología, Hospital Universitario de Salamanca, Salamanca, Spain*
[b]*Departamento de Nefrología, Hospital Universitario de Salamanca, Salamanca, Spain*

[*] Corresponding author:
E-mail addresses: treejooblanca@hotmail.com, btv2211@gmail.com (B. Trejo-Velasco).

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Use of Extracorporeal Membrane Oxygenator in Massive Pulmonary Embolism

Uso del oxigenador extracorpóreo de membrana venoarterial en pacientes con tromboembolia pulmonar de alto riesgo

To the Editor,

Massive or high-risk pulmonary embolism (PE) is defined as impaired pulmonary circulation capable of causing hypoxemia, right ventricular failure, and hemodynamic instability, leading to death in 25% of patients in shock or up to 65% if there is cardiopulmonary arrest (CPA).[1]

In patients who are more unstable due to severe shock, cardiac arrest, or labored breathing, commonly used reperfusion measures (eg, fibrinolysis, surgical embolectomy, or percutaneous procedures) may be insufficient or have delayed efficacy. In these patients, cardiopulmonary assistance based on the venoarterial extracorporeal membrane oxygenator (VA-ECMO) may be an option.[2] To date, several series have been published on the use of ECMO in high-risk PE, although there is little experience with the device in Spain.

In this study, we retrospectively analyzed cases of ECMO implantation in patients with high-risk PE at our hospital between July 2013 and June 2018. Implantation was indicated due to PE with in-hospital CPA or established shock refractory to catecholamines. In all patients, VA-ECMO was implanted by femoro-femoral cannulation in the interventional cardiology laboratory, the critical heart care unit, or the emergency department.[3] Patients received anticoagulation with sodium heparin, for a target international normalized ratio of 2.0 to 2.5 and anti-Xa factor of 0.3-0.6 IU/mL.

During the study period, a total of 11 VA-ECMO devices were implanted in patients with high-risk PE (Table 1), accounting for 13.8% of all 80 patients treated with ECMO at our hospital during this period. The mean age was 60 ± 8 years, and 8 (72.7%) patients were men. A total of 9 (81.8%) patients experienced CPA, and peripheral VA-ECMO was implanted during the arrest in 4 (36.4%) of them. Median lactate before implantation was 12 mmol/L [interquartile range, 8.5-14.5], and the median implantation time was 25 [22.5-35.0] minutes. A total of 8 (72.7%) patients received some form of early reperfusion therapy: isolated systemic fibrinolysis in 3, isolated percutaneous thrombectomy in 1, and combined percutaneous thrombectomy and fibrinolysis in 4 (2 local, 2 systemic). Among these 8 patients who underwent reperfusion, 7 (87.5%) experienced serious complications related to these therapies (6 major bleeding episodes related to fibrinolysis, 2 CPA events during thrombectomy). In the 4 patients who received ECMO during CPA, 2 were alive at discharge (50% survival), and the other 2 died, 1 of anoxic encephalopathy 48 hours after implantation and the other of multiorgan failure within 24 hours after the procedure. One of the 2 survivors experienced CPA in the interventional cardiology laboratory, undergoing early implantation of ECMO before thrombectomy. The second patient experienced CPA and underwent implantation in the emergency department, without subsequently requiring reperfusion therapy.

Total survival in the series was 45.5%, similar to that in other published series.[4–6] Of the 6 patients who died, 4 had anoxic encephalopathy and 2 had multiorgan failure. Patients who initially received ECMO alone had a higher survival rate (66.7%) than those who received early reperfusion therapy (37.5%). Furthermore, treatment with ECMO alone was not associated with major bleeding episodes.

Despite the inherent limitations of this type of study to establish differences, we believe that treatment with ECMO alone may be an effective alternative, as it allows thrombus dissolution by heparin and by spontaneous endogenous mechanisms, as well as the recovery of right ventricular function, possibly with fewer complications than when adding fibrinolysis or early thrombectomy. In patients refractory to this therapy, deferred surgical or percutaneous thrombectomy would be an option.[4,6]

Table 1
Patient Characteristics

Age, y	Sex	Implantation Time, min	Preimplantation Lactic Acid, mmol/L	History of CPA	Reperfusion Therapy	Days on ECMO	Survival at Discharge	Complications
65	M	50	12	Yes (EMD-H)	Yes (SF+T)	3	No	Major hemorrhage, encephalopathy
43	M	35	15	Yes (A-OOH)	Yes (SF and LF+T)	2	No	Encephalopathy
49	M	40	12	Yes (EMD-H)	Yes (T)	1	No	Encephalopathy, major hemorrhage
59	M	20	7	Yes (A-H)	Yes (SF+T)	1	Yes	Acute subdural hematoma
57	M	20	15	Yes (EMD-H)	No	4	Yes	No
59	M	25	14	Yes (A-H)	Yes (SF)	6	Yes	Major hemorrhage
67	F	25	8	No	Yes (SF)	5	No	Major hemorrhage, MOF
60	F	35	15	Yes (EMD-H)	Yes (SF)	6	No	MOF
65	F	20	9	No	No	4	Yes	NO
62	M	30	13	Yes (EMD-H)	Yes (T+LF)	5	Yes	Major hemorrhage, femoral pseudoaneurysm
74	M	25	4.6	Yes (EMD-H)	No	1	No	Encephalopathy

A, asystole; CPA, cardiopulmonary arrest; EMD, electromechanical dissociation; F, female; H, hospital; LF, local fibrinolysis; M, male; MOF, multiorgan failure; OOH, out-of-hospital; SF, systemic fibrinolysis; T, thrombectomy.

Raquel Luna-López,[a] Iago Sousa-Casasnovas,[a,*] Jorge García-Carreño,[a] Carolina Devesa-Cordero,[a] Francisco Fernández-Avilés,[a,b] and Manuel Martínez-Sellés[a,b,c]

[a]*Servicio de Cardiología, Hospital General Universitario Gregorio Marañón, CIBERCV, Madrid, Spain*
[b]*Facultad de Medicina, Universidad Complutense, Madrid, Spain*
[c]*Facultad de Medicina, Universidad Europea, Madrid, Spain*

[*] Corresponding author:
E-mail address: iagosousa@yahoo.es (I. Sousa-Casasnovas).

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