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Letter to the Editor

Pre-Hospital Extracorporeal Cardiopulmonary Resuscitation

To the Editor:

CONVENTIONAL CARDIOPULMONARY resuscitation (CPR) of out-of-hospital cardiac arrest (OHCA) displays dismal outcomes. Indeed, survival is reported to be between 2% and 11% in OHCA patients with attempted resuscitation.[1] The implantation of extracorporeal life support (ECLS) during CPR, namely extracorporeal cardiopulmonary resuscitation (ECPR), could be considered as a rescue option when standard resuscitation maneuvers fail and the suspected cause of the cardiac arrest is potentially reversible.[2] However, observational studies have identified several prognostic factors for ECPR, and the low-flow time is inversely associated with favorable neurologic outcome in OHCA.[3] Pre-hospital ECPR has been suggested in this specific setting to reduce the low-flow time and improve outcomes.[4]

Herein, we present our preliminary experience of pre-hospital ECPR. Because of national regulations on "non-interventional clinical research" (articles L.1121-1 and R.1121-2 of the French Public Health Code), authorization from an ethics committee and written informed consent from participants were not required because this observational study did not modify existing diagnostic or therapeutic strategies.

We started the ECLS program at our university hospital in January 2007, and the protocol for refractory OHCA was described previously.[5] In accordance with national recommendations, emergency medical service teams must respect a 30-minute mandatory time interval before cardiac arrest is considered refractory.[6] A pre-hospital ECPR multidisciplinary program also was implemented at our institution in June 2017. Pre-hospital ECLS implantation for the patient described herein was performed by 1 emergency medical service physician and 1 cardiac surgeon. The patient then was transferred to our medical intensive care unit.

Between June 2017 and December 2018, 11 patients (median age 39 [37-56] y, 10 males) received ECLS in the pre-hospital setting (Fig 1). The median arrival time of our team on site was 18.5 (16-24.2) minutes. At ECLS implantation, median end-tidal carbon dioxide was 22 (16.2-28.5) mmHg, and 4 (36.3%) patients presented with a shockable rhythm. Femoral cannulation failed in 1 (9.1%) patient, and median cannulation time was 19.5 (19-20.7) minutes. Median no-flow and low-flow times were 1 (0-3.7) and 76 (59-78.2) minutes, respectively. The causes of refractory OHCA were acute myocardial infarction (n = 5), hypertrophic cardiomyopathy (n = 3), and unknown (n = 3). Of the 5 acute myocardial infarction patients, 4 (80%) underwent percutaneous coronary interventions during ECLS support. Two (18.1%) patients presented with lower limb ischemia during ECLS support, and 1 (9.1%) patient required a surgical debridement of the groin because of a surgical site infection. Eight (72.7%) patients died during the first 48 hours of ECLS support (multiorgan failure n = 5, brain death n = 3), whereas 2 (18.1%) patients survived to hospital discharge with good neurologic outcome. Table 1 shows the main outcomes of our study population.

Fig 1. Extracorporeal cardiopulmonary resuscitation in the pre-hospital setting.

Table 1
Outcomes of the Study Population

Patient	Age	Sex	Cause of OHCA	Intervention on ECLS	Successful Weaning	Survival CPC 1-2
1	36	Male	STEMI	PCI	Yes	Yes
2	33	Male	STEMI	None	Yes	Yes
3	53	Female	Unknown	None	No	No
4	25	Male	Unknown	None	No	No
5	63	Male	STEMI	PCI	No	No
6*	58	Male	Unknown	NA	NA	NA
7	57	Male	STEMI	PCI	No	No
8	38	Male	HCM	None	No	No
9	39	Male	STEMI	PCI	No	No
10	38	Male	HCM	None	No	No
11	55	Male	HCM	None	No	No

* Cannulation failure.Abbreviations: CPC, cerebral performance category; HCM, hypertrophic cardiomyopathy; NA, not applicable, OHCA, out-of-hospital cardiac arrest; PCI, percutaneous coronary intervention; STEMI, ST segment elevation myocardial infarction.

The preliminary results of our experience showed that prehospital ECPR is feasible, although the small sample size of our patient population makes any statistical attempt to discuss its efficacy or safety inconclusive. Furthermore, future efforts of our multidisciplinary team should be focused on the reduction of low-flow time.

Declaration of Competing Interest

The authors have no conflicts of interest to disclose.

References

1 Berdowski J, Berg RA, Tijssen JG, et al. Global incidences of out-of-hospital cardiac arrest and survival rates: Systematic review of 67 prospective studies. Resuscitation 2010;81:1479–87.
2 Link MS, Berkow LC, Kudenchuk PJ, et al. Part 7: Adult advanced cardiovascular life support: 2015 American Heart Association guidelines update for cardiopulmonary resuscitation and emergency cardiovascular care. Circulation 2015;132(18 Suppl 2):S444–64.
3 Singer B, Reynolds JC, Lockey DJ, et al. Pre-hospital extra-corporeal cardiopulmonary resuscitation. Scand J Trauma Resusc Emerg Med 2018;26:21.
4 Lamhaut L, Hutin A, Puymirat E, et al. A Pre-hospital extracorporeal cardio pulmonary resuscitation (ECPR) strategy for treatment of refractory out hospital cardiac arrest: An observational study and propensity analysis. Resuscitation 2017;117:109–17.
5 Pozzi M, Armoiry X, Achana F, et al. Extracorporeal life support for refractory cardiac arrest: A 10-year comparative analysis. Ann Thorac Surg 2019;107:809–16.
6 Riou B, Adnet F, Baud F, et al. Guidelines for indications for the use of extracorporeal life support in refractory cardiac arrest. Ann Fr Anesth Reanim 2009;28:182–90.

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