

## A comprehensive approach to refractory cardiac arrest: saving more lives one way or another

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According with the last updated guidelines on resuscitation, the underlying cause of cardiac arrest (CA) should be identified, treated and, if possible, reversed with different strategies but a common target: to increase long-term survival with good neurologic recovery.

At the same time, some countries have implemented protocols for donation after considering the irreversibility of cardiac arrest and the failure of resuscitation attempts.

Both strategies are complementary and should coexist. Thus, we would be able to go beyond the refractory CA firstly and, if not indicated or unsuccessful, we could increase the organ donation pool after confirming irreversibility.

International recommendations on resuscitation (1) highlight the importance of high-quality cardiopulmonary resuscitation (CPR) based on minimal interruptions, focused on determining the cause of the cardiac arrest and offering, as early as possible, etiological treatment of potential reversible causes. Several pioneering protocols have been developed throughout the world in order to provide a multidisciplinary approach to the out-of-hospital (OHCA) and in-hospital cardiac arrest (IHCA).

Moreover, international programs including non-conventional resuscitation procedures (NCRPs) have been set up (2-7).

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Such an approach to refractory CA includes:

1. High-quality CPR with minimal interruptions: ongoing CPR during transportation to the hospital through automated chest compressors and ventilations, possible administration of thrombolytics in pulmonary embolism (1), and use of therapeutic mild hypothermia (3,7).
2. Management of IHCA, or incoming patient with OHCA undergoing CPR: percutaneous coronary intervention during CPR in coronary artery disease, or ECLS followed by thrombolysis, placement of an intra-aortic balloon pump, or therapeutic mild hypothermia (2-7).

The conclusions of published studies highlight in the need of validating a predictive model, to establish teams trained in the procedures, and to avoid delays in the initiation of the ECLS technique after admission of the patient to the hospital (minimizing the so-called low-flow period) (2,4-7).

Some countries are a reference in programs for uncontrolled donation after circulatory death (uDCD) (9-12): a patient who has an unexpected OHCA, and who fails to CPR attempts is transferred with continuing thoracic compressions and ventilation with the sole aim of preserving the organs (12). Thus, is driven to a hospital with the capacity to receive this type of donor, rather than to the hospital able to treat the underlying cause of CA, when possible (9-12).

The family, if not at the scene are asked by police to go to the hospital and there, they receive notification of the death of their relation. Transplant coordinators then ask them for authorization to the organ retrieval.

At this time, the deceased person is already in the operating room and has been

connected to an organ preserving system. This type of uDCD program provides 10% of all deceased donors in Spain (40% in Madrid region) (12).

There are evident similarities between the human, technical and logistical means made available for NCRPs and those required by uDCD programs (9-11).

We, obviously, support the need to obtain organs for donation, and the uDCD programs are essential for this laudable purpose (11).

However, priorities should be clear and transparent: inclusion in the uDCD program should be considered only after benefiting patients of NCRPs, if they were eligible for it (9-11).

Moreover, recent protocols even show that joining both strategies, not only survival outcomes rate increases, but also graft outcomes (3,7).

An unexplored path to achieve both these goals might be to implement a comprehensive management of OHCA that includes two options: 'Non-conventional resuscitation procedures option' in selected patients, focused on the reversible underlying primary cause of OHCA (option 1) or a protocol for uDCD (option 2) if the 'ongoing CPR option' is not indicated or judged futile, after conventional resuscitation attempts have been provided case-by-case.

To implement such a protocol requires to build a bridge linking prehospital and hospital settings.

Thus, by trying to save hopeless patients' lives, and when this is not possible, by increasing organ availability for transplantation, we will be providing excellent care to patients suffering refractory cardiac arrest on the field, and saving more lives by one or other way: firstly, through high-quality resuscitation, and secondly, when really impossible even after the best attempts, retaining donation and transplantation options after declaring death.

## REFERENCES

- Nolan JP, Soar J, Zideman DA, Biarent D, Bossaert LL, Deakin C, et al. European Resuscitation Council Guidelines for Resuscitation 2010 Section 1. Executive summary. *Resuscitation* 2010; 81: 1219-76.
- Sunde K. Experimental and clinical use of ongoing mechanical cardiopulmonary resuscitation during angiography and percutaneous coronary intervention. *Crit Care Med* 2008; 36(11 Suppl): S405-8.
- Fagnoul D, Taccone FS, Belhaj A, Rondelet B, Argacha JF, Vincent JL, et al. Extracorporeal life support associated with hypothermia and normoxemia in refractory cardiac arrest. *Resuscitation* 2013; 84: 1519-24.
- Chen YS, Lin JW, Yu HY, Ko WJ, Jerng JS, Chang WT, et al. Cardiopulmonary resuscitation with assisted extracorporeal life support versus conventional cardiopulmonary resuscitation in adults with in-hospital cardiac arrest: an observational study and propensity analysis. *Lancet* 2008; 372: 554-61.
- Lazzeri C, Bernardo P, Sori A, Innocenti L, Stefano P, Peris A, et al. Venous-arterial extracorporeal membrane oxygenation for refractory cardiac arrest: a clinical challenge. *Eur Heart J Acute Cardiovasc Care*. 2013; 2: 118-26.
- Adnet F, Baud F, Cariou A, Carli P, Combes A, Devictor D, et al. Guidelines for indications for the use of extracorporeal life support in refractory cardiac arrest. French Ministry of Health. *Ann Fr Anesth Reanim* 2009; 28: 182-90.
- Belohlavek J, Kucera K, Jarkovsky J, Franek O, Pokorna M, Danda J, et al. Hyperinvasive approach to out-of-hospital cardiac arrest using mechanical chest compression device, prehospital intraarrest cooling, extracorporeal life support and early invasive assessment compared to standard of care. A randomized parallel groups comparative study proposal. "Prague OHCA study". *J Transl Med*. 2012; 10: 163.
- Dumas F, Cariou A, Manzo-Silberman S, Grimaldi D, Vivien B, Rosencher J, et al. Immediate Percutaneous Coronary Intervention Is Associated With Better Survival After Out-of-Hospital Cardiac Arrest. Insights From the PROCAT (Parisian Region Out of Hospital Cardiac Arrest) Registry. *Circ Cardiovasc Interv* 2010; 3: 200-7.
- Doig CJ, Zygun DA. (Uncontrolled) donation after cardiac determination of death: a note of caution. *J Law Med Ethics* 2008; 36: 760-5.
- Bracco D, Noiseux N, Hemmerling TM. The thin line between life and death. *Intensive Care Med* 2007; 33: 751-4.
- Rodríguez-Arias D, Ortega I. Protocols for Uncontrolled donation after circulatory death. *Lancet*. 2012; 379: 1275-6.
- Matesanz R, Coll Torres E, Dominguez-Gil Gonzalez B, et al. [Donación en asistolia en España: situación actual y recomendaciones]. *ONT*. 2012. Madrid.

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