



EDITORIAL

Uncontrolled non-heart beating donation: Need, opportunity and challenge[☆]

Donación en asistolia no controlada: necesidad, oportunidad y reto

R. Matesanz*, B. Domínguez-Gil, E. Coll

Organización Nacional de Trasplantes, Madrid, Spain

The *Third Global Consultation* of the World Health Organization (WHO) on donation and transplants was held in Madrid (Spain) in March 2010.¹ Through the *Madrid Resolution*, representatives of 70 countries from all over the world called for progress toward self-sufficiency in transplantation. Self-sufficiency is seen as a necessity not only to reduce mortality on the waiting list, but also to control ethically unacceptable practices such as trafficking in organs and transplant tourism.² With almost 90 transplant procedures per million of population (pmp) in the year 2011, Spain is in a privileged position for achieving self-sufficiency, setting the bases for a roadmap that includes donation as an integral part of the end-of-life setting in all possible death circumstances.³

Brain dead donors (BDD) are the most frequent source of organs for transplantation: approximately 90% of all donors in Spain are people in whom death has been diagnosed according to neurological criteria.⁴ The donation levels reached in our country, fundamented upon BDD, come close to excellence—though this does not mean that there is no room for improvement.^{5,6} Nevertheless, BDD as an option is becoming exhausted both quantitatively and qualitatively. Continued auditing in the critical care units of hospitals authorized for organ donation in Spain reflects a dramatic decrease in the potential for donation in BDD, from 65 donors pmp in 2001 to 49 donors pmp in 2010.⁷

This decrease is attributable to the reduction in traffic accident deaths and stroke mortality, common to all European countries, and to the more widespread practice of operations such as decompressive craniotomy in traumatic and atraumatic brain injuries. Furthermore, the mean age of BDD is progressively increasing, as a result of the current prevalence of cerebrovascular events as cause of death *versus* traumatic brain damage.⁴

In this context we need to find alternatives in donation to cover the transplantation demands. This has led our system to revisit non-heart beating donation (NHBD). This type of donation is as old as transplantation itself, since the first procedures were carried out with organs obtained from people who had died according to criteria which we would now call circulatory and respiratory criteria.⁸ Furthermore, in the midst of debate about the ethical aspects of heart transplantation from non-heart beating donors, it should be remembered that the first heart transplant performed by Christiaan Barnard in 1967 involved the heart of a donor who had died according to the aforementioned circulatory criteria.⁹ The interest in recovering non-heart beating donation is common to a number of countries, as evidenced on occasion of the first international congress on this aspect, held in Maastricht in 1995.¹⁰

Since then there has been an exponential increase in the number of NHBD worldwide (an estimated 8% of the donors reported to the *Global Observatory on Donation and Transplantation* correspond to NHBD), though with the particularity that this increase has only occurred in a limited number of countries, and with clear polarization as regards the type of non-heart beating donation, depending on the country involved.¹¹ Thus, in countries such as Australia,

[☆] Please cite this article as: Matesanz R, et al. Donación en asistolia no controlada: necesidad, oportunidad y reto. *Med Intensiva*. 2013; 37: 221–3.

* Corresponding author.

E-mail address: rmatesanz@msssi.es (R. Matesanz).

Belgium, Canada, the United States, the Netherlands and the United Kingdom, among others, emphasis has been placed on so-called controlled donation after circulatory death (DCD), involving donation from people who die after limitation of life-sustaining treatment.¹² In contrast, the predominant type in Spain is uncontrolled NHBD, corresponding to people who die following cardiorespiratory arrest with failed cardiopulmonary resuscitation maneuvering—the modality addressed by Pérez-Villares et al. in their article in the present issue of *MEDICINA INTENSIVA*.¹³ Very few countries have been able to reproduce the Spanish experience. France is the only country to have developed a solid program similar to our own, and which was launched in 2006.¹⁴ Other countries have had donors of this type, though always in very limited numbers.¹² After estimating that uncontrolled NHBD could increase the pool of organ donors by 22,000 per year in the United States,¹⁵ the city of New York has worked on a protocol for years, though it has not yet been implemented.¹⁶ The difficulty of introducing uncontrolled NHBD in other countries is related to ethical-legal issues on one hand and to the technical and organizational complexity inherent to this type of donation on the other.

In 1995, the Spanish National Transplant Organization coordinated the development of a *Consensus Document on Non-heart Beating donation*,¹⁷ in which it was agreed not to consider the development of DCD and to promote uncontrolled NHBD within a specific legal setting defined by Spanish *Royal Decree 2070/1999*.¹⁸ Recently, the national consensus document has been updated, incorporating also DCD, and representing a clear impulse for uncontrolled NHBD in Spain.¹⁹ In fact, for years uncontrolled NHBD was confined to three cities in this country: A Coruña, Barcelona and Madrid—with quantitatively very significant activity in the latter two (there were also cases in Málaga during the 1990s). The abovementioned technical and organizational complexity was recognized as a clear hindering factor for applying new programs in other Spanish cities.

With their experience, Pérez-Villares et al. have broken down barriers that were more imagined than real against the start of a program of this kind. In the development of such a protocol, vision, institutional support, organization and coordination effort, training of all the implicated professionals, and excellent communication have all been key elements. In our opinion, a number of salient aspects of the program summarized by the authors deserve special mention. On one hand, the program has been placed into operation with a population below or at the initially recommended limit of 500,000 inhabitants—demonstrating its feasibility and substantial impact upon the levels of donation and transplantation activity. Of note is the extraordinary effectiveness of the program, with a high percentage of potential donors transformed into real donors, and a high conversion rate of the latter into used donors. Such effectiveness is in contrast to the global situation in Spain, where performance is substantially lower—this being a source of concern in view of the enormous organizational, human and technical efforts required by each donation procedure. In our opinion, the described effectiveness is the result of extreme care in the selection of potential donors and the availability of different preservation techniques. Although randomized clinical trials are needed to contrast this clinical observation, the experience gained by

some groups suggests superiority of extracorporeal membrane oxygenation (ECMO) under conditions of hypothermia, and particularly under normothermic conditions (NECMO), versus *in situ* cold preservation for the preservation of abdominal organs, in terms of both organ viability and post-transplantation outcomes.²⁰ However, preservation with ECMO/NECMO implies technical complexity and costs which can pose obstacles for programs undergoing development. In addition, in some cases, the technique based on extracorporeal circulation is complicated by a lack of integrity of the vascular tree or other reasons—causing suspension of the donation process after the important efforts made. We therefore consider it a good strategy on the part of the authors to be able to have both preservation techniques available as a means to avoid unnecessary donor losses, particularly considering that such availability appears to be related to the obtainment of good post-transplantation results. Regarding this latter point, it is essential to stress the good results obtained with renal transplantation from such donors, and the promising beginnings of liver transplantation.²¹ Finally, development of the program has been made without any major budget impact – this being particularly important considering the current economical restrictions in the country and their impact upon the healthcare system.

Many areas for improvement remain in uncontrolled NHBD. New strategies are needed to lessen the logistic complexity of the process, reducing the time restrictions as far as possible. An interesting point in this sense is the protocol recently described in Saint Petersburg, combining the administration of fibrinolytic agents, extracorporeal circulation and leukapheresis to allow warm ischemia times of up to 90 min from the diagnosis of death, with excellent post-transplantation renal function and no cases of primary graft non-function.²² The cost-effectiveness of these programs is also an issue meriting future evaluation with a view to defining the convenience of developing new Alpha Codes.

The difficulties and challenges inherent to uncontrolled NHBD give extraordinary value to the introduction and development of new programs such as that of Granada, San Juan (Alicante), Santander, Seville or Valencia. All of them have shown that enthusiasm, continued effort and, in many cases, inventiveness, are able to truly increase the transplantation possibilities for many patients and to establish donation as an integral part of end-of-life care in circumstances as complex as death following out-hospital cardiac arrest.

References

1. The Madrid resolution on organ donation and transplantation. National responsibilities in meeting the needs of patients, guided by the WHO principles. *Transplantation*. 2011;91 Suppl. 11:S29–31.
2. Steering Committee of the Istanbul Summit. Organ trafficking and transplant tourism and commercialism: the Declaration of Istanbul. *Lancet*. 2008;372:5–6.
3. Matesanz R, Dominguez-Gil B. Strategies to optimize deceased organ donation. *Transplant Rev*. 2007;21:177–88.
4. Memoria anual de actividad de la Organización Nacional de Trasplantes. Página web de la ONT. Available from: <http://www.ont.es> [accessed 11.02.13].

5. Matesanz R, Domínguez-Gil B, Coll E, de la Rosa G, Marazuela R. Spanish experience as a leading country: what kind of measures were taken? *Transpl Int*. 2011;24:333–43.
6. Matesanz R, Marazuela R, Domínguez-Gil B, Coll E, Mahillo B, de la Rosa G. The 40 donors per million population plan: an action plan for improvement of organ donation and transplantation in Spain. *Transplant Proc*. 2009;41:3453–6.
7. De la Rosa G, Domínguez-Gil B, Matesanz R, Ramón S, Alonso-Álvarez J, Araiz J, et al. Continuously evaluating performance in deceased donation: the Spanish quality assurance program. *Am J Transplant*. 2012;12:2507–13.
8. Bernat JL, Capron AM, Bleck TP, Blosser S, Bratton SL, Childress JF, et al. The circulatory–respiratory determination of death in organ donation. *Crit Care Med*. 2010;38:963–70.
9. Romano R. Non-heart-beating donor: an extraordinary example of translational medicine research. *Transl Med*. 2012;4:105.
10. Kootstra G, Daemen JH, Oomen AP. Categories of non-heart-beating donors. *Transplant Proc*. 1995;27:2893–4.
11. Observatorio Global de Donación y Trasplante. Available from: <http://www.transplant-observatory.org/Pages/home.aspx> [accessed 11.02.13].
12. Domínguez-Gil B, Haase-Kromwijk B, van Leiden H, Neuberger J, Coene L, Morel P, et al. Current situation of donation after circulatory death in European countries. *Transpl Int*. 2011;24:676–86.
13. Pérez-Villares JM, Lara-Rosales R, Pino-Sánchez F, Fuentes-García P, Gil-Piñero E, Osuna-Ortega A, et al. Código alfa. Inicio de un nuevo programa de donación en asistolia. *Med Intensiva*. 2013;37:223–30.
14. Abboud I, Viglietti D, Antoine C, Gaudez F, Meria P, Tariel E, et al. Preliminary results of transplantation with kidneys donated after cardiocirculatory determination of death: a French single-centre experience. *Nephrol Dial Transplant*. 2012;27:2583–7.
15. Childress JF, Liverman CT, Institute of Medicine (U.S.). Committee on increasing rates of organ donation. Organ donation: opportunities for action. Washington, DC: National Academies Press; 2006.
16. Wall SP, Kaufman BJ, Gilbert AJ, Yushkov Y, Goldstein M, Rivera JE, et al. Derivation of the uncontrolled donation after circulatory determination of death protocol for New York City. *Am J Transplant*. 2011;11:1417–26.
17. Matesanz R. Documento de consenso español sobre extracción de órganos de donantes en asistolia. *Nefrología*. 1996;16 Suppl. 2:48–53.
18. Real Decreto 2070/1999, de 30 de diciembre, por el que se regulan las actividades de obtención y utilización clínica de órganos humanos y la coordinación territorial en materia de donación y trasplante de órganos y tejidos. Página web de la ONT. Available from: <http://www.ont.es/infesp/Legislacin/REAL-DECRETO.DONACION.Y-TRASPLANTE.pdf> [accessed 11.02.13].
19. Donación en asistolia en España: situación actual y recomendaciones. Documento de Consenso 2012. Página web de la ONT. Available from: <http://www.ont.es/infesp/DocumentosDeConsenso> [accessed 11.02.13].
20. Valero R, Cabrer C, Oppenheimer F, Trías E, Sánchez-Ibáñez J, de Cabo FM, et al. Normothermic recirculation reduces primary graft dysfunction of kidneys obtained from non-heart-beating donors. *Transpl Int*. 2000;13:303–10.
21. De Gracia MC, Osorio JM, Pérez-Villares JM, Galindo P, Ruiz MC, Pérez-Marfil A, et al. A new program of kidney transplantation from donors after cardiac death in Spain. *Transplant Proc*. 2012;44:2518–20.
22. Reznik O, Skvortsov A, Loginov I, Ananyev A, Bagnenko S, Moysyuk Y. Kidney from uncontrolled donors after cardiac death with one hour warm ischemic time: resuscitation by extracorporeal normothermic abdominal perfusion “in situ” by leukocytes-free oxygenated blood. *Clin Transplant*. 2011;25:511–6.