



EDITORIAL

Increasing the number of valid lungs for transplantation: a necessity[☆]

Incrementar el número de pulmones válidos para trasplante: una necesidad

F. del Río Gallegos

Coordinación de Trasplantes, Hospital Clínico San Carlos, Madrid, Spain

Solid organ transplantation is currently a well-established management option for a range of diseases. Lung transplantation in many cases proves life-saving, and in some cases is indicated on a rescue basis—representing the only possible treatment option in end-stage respiratory failure. Of all the solid organs amenable to transplantation, the lungs represent one of the least frequent interventions, because of their extreme fragility. Mechanical ventilation – essential during the period in which the donor is admitted and up until brain death – and the risk of infection associated to ventilation both exert deleterious effects upon lungs amenable to transplantation. In the year 2010 there were a total of 1502 organ donations in Spain, of which only 323 (21.5%) represented potential lung donations. In turn, of these 323 organs, only 201 reached the transplantation phase (13.3% of the total donations that year).¹ The existing shortage of organs valid for transplantation, and the consolidation of this kind of treatment as the only valid option for many patients, have made it necessary to explore new possibilities among the so-called marginal or expanded criteria donors.

The obtainment of organs from donors after cardiac death or from non-heart beating donors,² and the harvesting of lungs from elderly patients, are currently evaluated options that offer excellent results.

Among the usual criteria for discarding potential lung donors, smoking, radiological alterations and prolonged tra-

chea intubation have been those most often transgressed by different surgical groups—with good clinical results.^{3,4} One of the most firmly remaining exclusion criteria is donor age—defined as 55 years, maximum. Miñambres et al.⁵ studied the short, middle and long term outcomes obtained with lungs from donors over age 55 years. The results were seen to be good, and the authors concluded that resorting to such donors undoubtedly represents a valid option for dealing with the existing organ shortage. In their study, involving 33 lung transplant recipients with adequately selected donors aged 55 years or older, the survival data were found to be similar to those obtained with lungs from donors under 55 years of age.

However, the important loss of lungs potentially valid for transplantation purposes among non-marginal donors who die in Intensive Care Units has made it necessary to develop guides and recommendations aiming to minimize the damage caused by mechanical ventilation, in an attempt to increase the number of available organs. Previous studies have demonstrated the need and usefulness of applying protective measures in the brain death donor, with a view to increase the number of valid lungs for transplantation. Thus, Mascia et al.^{6,7} and Noiseux et al.⁸ place special emphasis on the usefulness of protective ventilation and recruitment maneuvers.

In Spain in 2006, the National Transplant Organization gathered a group of experts from different scientific societies with the purpose of developing a protocol for the maintenance of chest organ donors.^{9,10} This protocol has been introduced in most Departments of Intensive Care Medicine in the country, and has made it possible to increase organ recovery and to expand the overall number of lung

[☆] Please cite this article as: Del Río Gallegos F. Incrementar el número de pulmones válidos para trasplante: una necesidad. *Med Intensiva*. 2011;35:401–2.

E-mail address: frio.hcsc@salud.madrid.org

transplantations performed. Undoubtedly, protective ventilation following the current recommendations for the management of patients with acute respiratory distress syndrome,¹¹ and the use of recruitment maneuvers and apnea test in ventilator CPAP mode, avoiding depressurization of the airway,¹² have contributed to increase the number of valid lungs. Other measures, applied by different groups, such as selective digestive decontamination for the prevention of ventilation associated pneumonia, also may be effective in securing a larger number of organs.^{13,14} Without doubt, the cold ischemia time between organ explantation and implantation in the recipient plays a decisive role in the appearance of reperfusion damage. Devices are being developed, designed to maintain organ preservation with blood or preservation fluid, in order to attenuate the deleterious effects of cold ischemia.¹⁵ Additional measures, such as adequate selection of the preservation fluid for maintaining the lungs during the cold ischemia phase, might possibly improve the transplantation results, and in future expand the inclusion criteria and thus the pool of valid organ donors.¹⁶ It remains to be determined whether procedures aiming to ensure even more meticulous hemodynamic management of the donor, with monitorization of extravascular pulmonary water in order to keep it to a minimum, are able to contribute to rescue a larger number of organs.

The experience of the transplant teams has made it possible to expand the theoretical limits for lung donation, with the successful inclusion of donors above 55 years of age.⁵ Careful evaluation of the donor, with the application of strict protocols to harvest a single lung in patients with unilateral damage, or in patients with pulmonary thromboembolism subjected to post-explantation pulmonary thromboembolism, are a clear illustration of the need for valid organs for transplantation and of the efficacy of the transplant teams in dealing with a healthcare problem of exceptional relevance.

There is no doubt as to the importance of establishing procedures for rescuing patients on the lung transplantation waiting list, or of the key role played in this sense by the Departments of Intensive Care Medicine as the natural setting where brain death donors are maintained, and as the reference for the development of specific procedures allowing us to increase the number of valid lung donors.

References

1. Available at: http://www.ont.es/infesp/Memorias/Dossier_donantes_2010_web.pdf [retrieved 1 May 2011].
2. Del Río-Gallegos F, Escalante-Cobo JL, Núñez-Peña JR, Calvo-Manuel E. Donación tras la muerte cardiaca. Parada cardiaca en el mantenimiento del donante en muerte encefálica. *Med Intensiva*. 2009;33:327–35.
3. Aigner C, Winkler G, Jaksch P, Seebacher G, Lang G, Taghavi S. Extended donor criteria for lung transplantation—a clinical reality. *Eur J Cardiothorac Surg*. 2010;89:1756–64.
4. Reyes KG, Mason DP, Thuita L, Nowicki ER, Murthy SC, Petterson GB, et al. Guidelines for donor lung selection: time for revision? *Ann Thorac Surg*. 2010;89:1756–64.
5. Miñambres E, Zurbano F, Naranjo S, González-Castro A, Mons R, González Fernández C, et al. Trasplante pulmonar con donantes de edad marginal ≥ 55 años. *Med Intensiva*. 2011;35:403–9.
6. Mascia L, Bosma K, Pasero D, Galli T, Cortese G, Donadio P, et al. Ventilatory and haemodynamic management of potential organ donors: an observational survey. *Crit Care Med*. 2006;34:321–7.
7. Mascia L, Pasero D, Slitsky S, Arguis MJ, Berardino M, Grasso S, et al. Effect of a lung protective strategy for organ donors on eligibility and availability of lungs for transplantation. *JAMA*. 2010;304:2620–7.
8. Noiseux N, Nguyen BK, Marsolais P, Dupont J, Simard L, Houde I, et al. Pulmonary recruitment protocol for organ donors: a new strategy to improve the rate of organ utilization. *Transplant Proc*. 2009;41:3284–9.
9. Grupo de Trabajo para el mantenimiento del donante de órganos torácicos. Protocolo de manejo del donante torácico: estrategias para mejorar el aprovechamiento de órganos. *Rev Esp Trasp*. 2006;15:9–18.
10. Del Río F, Escudero D, de la Calle B, Gordo Vidal F, Valentín Paredes M, Núñez JR. Evaluación y mantenimiento del donante pulmonar. *Med Intensiva*. 2009;33:40–9.
11. Ventilation with lower tidal volume as compared with traditional tidal volume for acute lung injury and the acute respiratory distress syndrome. The acute Respiratory Distress Syndrome Network. *N Eng J Med*. 2000;342:1301–8.
12. Lévesque S, Lessard M, Nicole P, Langevin J, Leblanc F, Lauzier F, et al. Efficacy of a T-piece system and a continuous positive airway pressure system for apnea testing in the diagnóstico of brain death. *Crit Care Med*. 2006;34:2213–6.
13. García-Hierro P, de la Cal MA, van Saene HK, Silvestri L. Un nuevo ensayo clínico con descontaminación digestiva selectiva. *Med Intensiva*. 2009;33:297–300.
14. De Smet AM, Kluytmans JA, Cooper BS, Mascini EM, Benus RF, Van der Werf TS, et al. Decontamination of the digestive tract and oropharynx in ICU patients. *N Engl J Med*. 2009;360:20–31.
15. Escalante Cobo JL, Del Río Gallegos F. Preservación de órganos. *Med Intensiva*. 2009;33:282–92.
16. Miñambres E, González-Castro A, Rabanal JM, Suberviola B, Ortega FJ, Zurbano F, et al. Estudio comparativo de dos soluciones de preservación en la función inicial del trasplante bipulmonar en humanos. *Med Intensiva*. 2007;31:1–5.