



Review Article

Normothermic Perfusion Machine in Liver Transplant With Cardiac Death Donor Grafts[☆]



Mihai-Calin Pavel,^{*} Constantino Fondevila Campo, David Calatayud Mizrahi, Joana Ferrer Fabrega, Santiago Sanchez Cabus, Víctor Molina Santos, Josep Fuster Obregon, Juan Carlos Garcia-Valdecasas Salgado

Servicio de Cirugía Hepática y Trasplante Hepático, Hospital Clínic de Barcelona, Spain

ARTICLE INFO

Article history:

Received 6 May 2015

Accepted 18 May 2015

Available online 14 October 2015

Keywords:

Donation after cardiac death

Liver transplantation

Normothermic perfusion

Warm ischemia

ABSTRACT

The increasing difference between the number of patients in waiting lists for liver transplantation and the number of available donors has generated a great interest in the use of non-ideal organs, like grafts obtained from cardiac death donors (DCD). However, the extreme sensibility to ischemia of these livers results in a low utilisation rate and a high percentage of post-transplant complications and re-transplantation. Normothermic perfusion machines (NMP) emerged as an alternative that tries to maintain the viability of the organ and even to improve its function. This review focuses on current results of DCD liver transplantation and on the role that NMP may have in this field.

© 2015 AEC. Published by Elsevier España, S.L.U. All rights reserved.

La máquina de perfusión normotérmica en el trasplante hepático con injertos provenientes de donación en asistolia

RESUMEN

La diferencia cada vez mayor entre el número de pacientes en espera para un trasplante hepático y el número de donantes disponibles ha generado un gran interés en la utilización de órganos «no ideales» como es el caso de los provenientes de donantes en asistolia. Sin embargo, la sensibilidad de estos hígados a la isquemia hace que su tasa de utilización sea baja y las tasas de complicaciones y retrasplante mayores que en el trasplante convencional. Las máquinas de perfusión normotérmica exvivo (MPN) surgen como una opción para intentar mantener la viabilidad de estos órganos e incluso mejorar su función. Esta revisión se centra en los resultados actuales obtenidos en el trasplante hepático con órganos provenientes de donantes en asistolia y el papel que puede tener la MPN en este campo.

© 2015 AEC. Publicado por Elsevier España, S.L.U. Todos los derechos reservados.

Palabras clave:

Donación en asistolia

Trasplante hepático

Perfusión normotérmica

Isquemia caliente

[☆] Please cite this article as: Pavel MC, Fondevila Campo C, Calatayud Mizrahi D, Ferrer Fabrega J, Sanchez Cabus S, Molina Santos V, et al. La máquina de perfusión normotérmica en el trasplante hepático con injertos provenientes de donación en asistolia. Cir Esp. 2015;93:485-491.

^{*} Corresponding author.

E-mail address: mikepav2003@yahoo.com (M.-C. Pavel).

Introduction

The success of liver transplants (LT) has resulted, as a secondary effect, in a major difference between the number of patients on waiting lists (WL) for LT and the number of organs available. According to the latest data from UNOS, 15 290 patients in the US were on WL for LT at the end of 2012, whereas only 6256 transplants were conducted in total that year.¹ The scenario is similar in Spain, with 1093 LT conducted in 2013, but with 1997 patients on WL.²

One alternative available to increase the number of grafts is the use of organs from non-heart-beating donors (NHBD). However, due to the warm ischemia times (WIT) commonly associated with NHBD, the use of this type of organ is related to higher rates of graft loss and other complications. The use of ex vivo normothermic perfusion machines (NMP) would be interesting in LT, since the extreme responsiveness of these livers to ischemia results in a very low usage rate of organs from NHBD. This review focuses on the current state of NHBD in LT and on the role of NMP in its future development.

Historical Perspective and Current Legal Status of Non-heart-beating Donation in Spain

Even though the donors used in the early stages of transplant programs were NHBD, their use has not become widespread after Harvard's definition of brain death in 1967, and due to poor results.³ However, the scarce availability of suitable donors and the success of NHBD liver transplants resulted in a review of this trend during the 1990s.

In 1995, the Maastricht consensus conference defined the classification of NHBD (Table 1).⁴

The division of NHBD into "controlled" and "uncontrolled" was added later, and it reflects the importance of WIT in the prognosis for the corresponding organ, once transplanted. In "controlled" donors, death is expected and, as a consequence, WIT is known (and lower, in most cases). Conversely, the "uncontrolled" NHBD implies an unexpected cardiopulmonary arrest. In these cases, WIT is usually more difficult to calculate (and usually longer).⁵

Both in the US and Europe, clinical guidelines have been developed to determine the key points of NHBD (definition of cardiac death, WIT and cold ischemia times [CIT], maximum transaminase levels, etc.).^{6,7} Although the application of these strict criteria for selecting donors has helped to lower post-transplant complication rates, the ratio of LT with grafts from NHBD has not increased over the last decade.^{6,8} Unlike

NHBD kidney transplants, a significant number of livers are discarded.

In Spain, the current legal status makes NHBD donation even more interesting. Until recently, the only type of NHBD allowed in Spain was uncontrolled.⁹ As a consequence, our group has conducted an intense experimental study focused on NHBD type 2, to show the usefulness of normothermic oxygenation through the extracorporeal membrane,¹⁰⁻¹⁵ and it has later conducted the NHBD type 2 LT protocol with a systematic application of normothermic regional perfusion (NMRP), the results of which are not statistically lower than those for LT from brain-dead donors (BDD).^{7,16-18} The publication of RD 1723/2012,¹⁹ which includes type 3 donation, introduces a major shift in donation prospects, particularly for centres experienced in NHBD.

Current Results of Non-heart-beating Donation

The results for NHBD LT worldwide are still lower than those obtained in LT from BDD. Although there is no statistically significant difference between most studies with regard to patient survival (survival after three years 66.9%–77% in NHBD vs 77%–80% in BDD),²⁰⁻²³ graft survival is clearly lower in NHBD (48.8–65 vs 72%–80% in BDD, with a graft failure OR of 1.59–1.87 for NHBD).^{20,24-28}

These differences recorded for graft survival are the result of higher rates of primary graft failure,^{20,24,28} but with reference to the ischemic cholangiopathy (IC) index, are much higher for NHBD grafts. IC occurs as a result of the responsiveness of the biliary epithelium to ischemic lesions and is evidenced by 15%–37% of NHBD recipients.²⁴ It is evidenced by the appearance of bile duct stricture areas at the intrahepatic level. As a clinical consequence, IC patients present symptoms of cholangitis and recurring liver abscesses. When the causes of retransplant in NHBD liver recipients are analysed, IC is the most frequent cause.²⁸

With regard to factors related to a higher graft failure rate, WIT and CIT are two of the most important factors related to poor post-transplant progress. Most centres call for a WIT of less than 20 min.²² A CIT over 8 h. is associated with 30.4% of graft failure, whereas for a CIT over 10 h, there is graft failure in 58.3% of cases.²⁰

These results have had the secondary effect of encouraging caution when deciding whether a NHBD liver is valid for LT. After analysing data from UNOS, Orman notes that the proportion of liver grafts discarded for LT based on their NHBD origin increased from 9% in 2004 to 28% in 2010.²⁹

All this data points to the extreme responsiveness of NHBD livers to ischemia (both cold and warm). In this context, the use of NMP, particularly combined with NMRP, would keep graft exposure to ischemia at a minimum.

Normothermic Perfusion Machine in Experimental Studies

The use of NMP is not a new technology. During the first half of the 20th century perfusion of several organs had been attempted with normothermic oxygenated serum, proving

Table 1 – Maastricht's Classification of NBHD.

I	Deceased outside hospital	Uncontrolled	Infrequent
II	Unsuccessful resuscitation	Uncontrolled	Very frequent
III	Waiting for cardiac arrest	Controlled	Frequent
IV	Cardiac arrest in brain death	Controlled	Infrequent

Download English Version:

<https://daneshyari.com/en/article/4254709>

Download Persian Version:

<https://daneshyari.com/article/4254709>

[Daneshyari.com](https://daneshyari.com)