30º CONGRESO SETH
SOCIEDAD ESPAÑOLA DE TRASPLANTE HEPÁTICO
22 - 24 octubre 2025
Adda, Auditorio de la Diputación de Alicante

EXPERIENCIA HOPE EN ESPAÑA

Luis Secanella

Unidad de Trasplante Hepático
Hospital Universitari de Bellvitge

INDICE

- El camino del HOPE.
- Aparición en España. Desafíos.
- Evidencia actual.
- Experiencia inicial en España.

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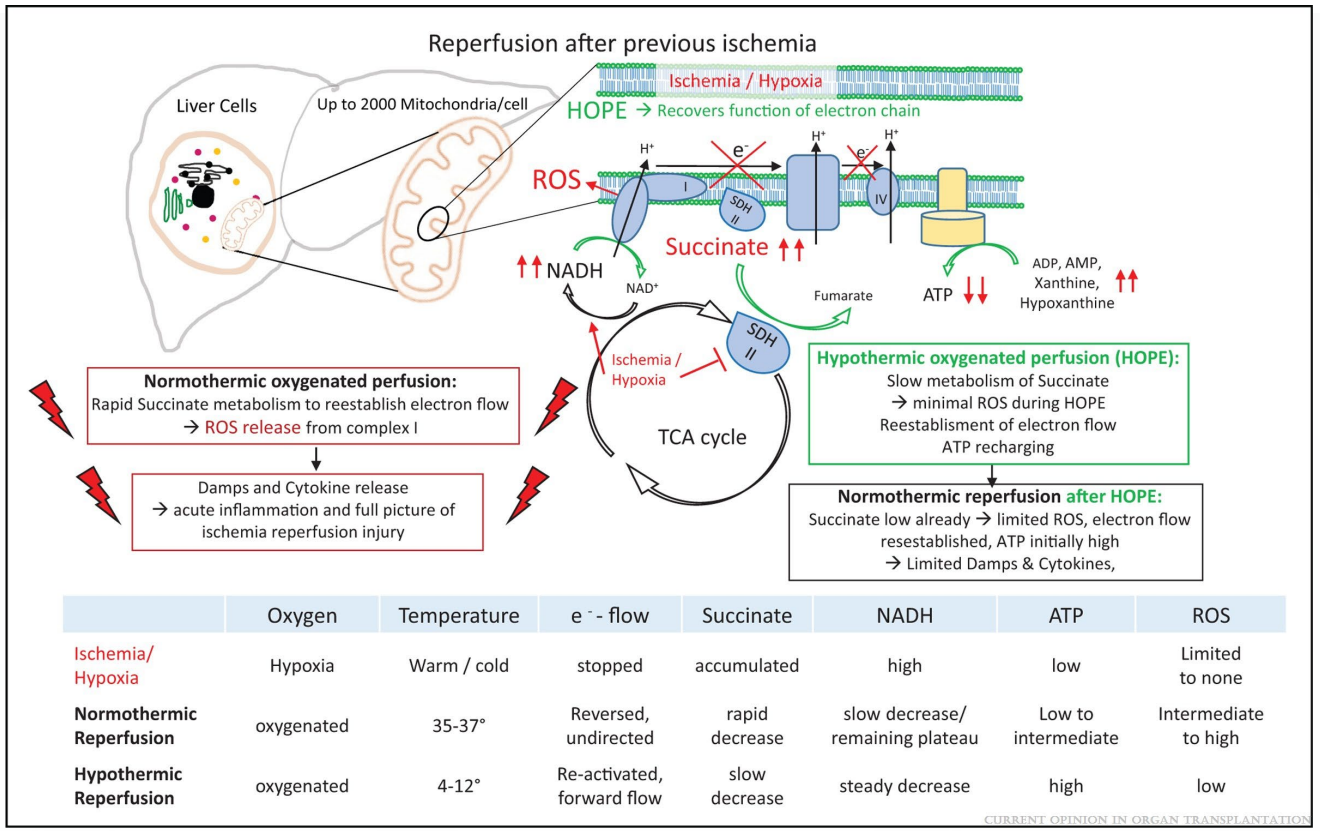
El camino del HOPE

- Desequilibrio pacientes en lista / injertos disponibles → Uso de injertos subóptimos
  - Más susceptibles lesión por isquemia – reperfusión (isquemia fría)
  - Mayor riesgo de complicaciones postoperatorias / pérdida del injerto

Edad donante
Obesidad y Sd Metabólico (Esteatosis)
Criterios Expandidos en DCD

Mitochondria and ischemia reperfusion injury

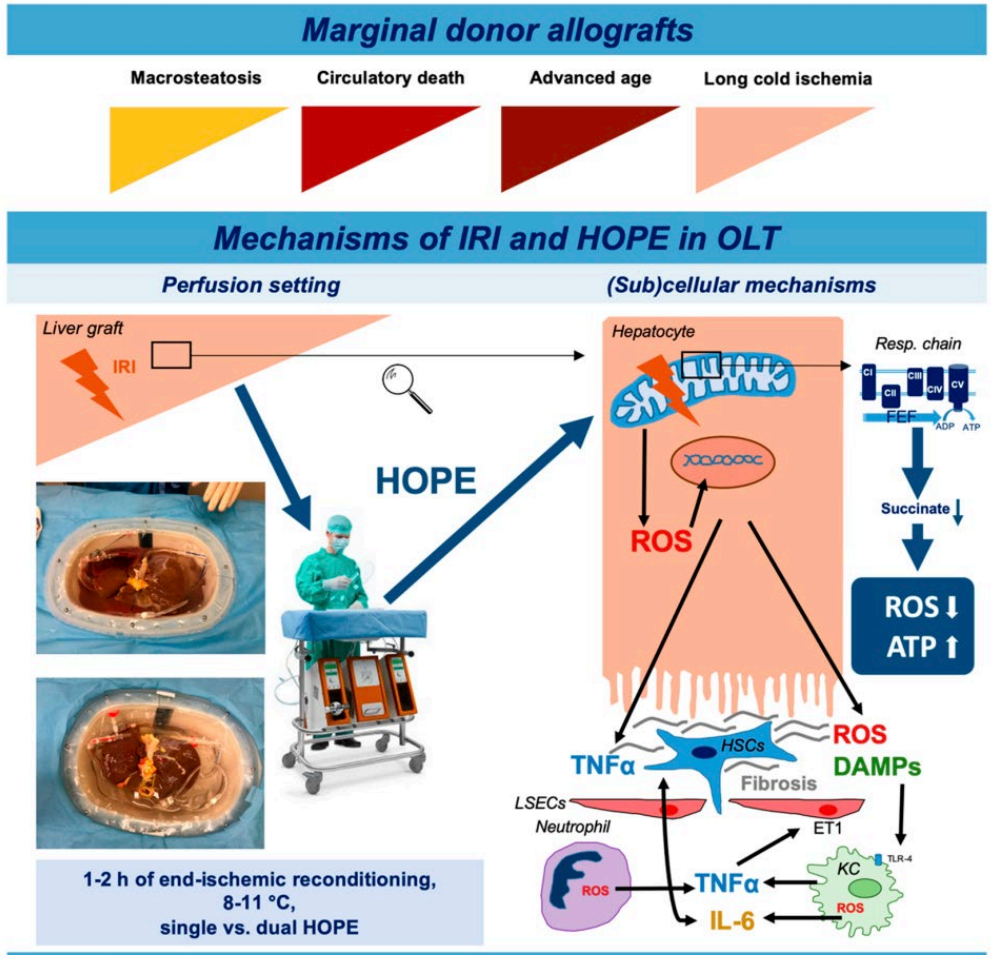
Rebecca Panconesi[a,b,*], *Jeannette Widmer*[c,*], *Mauricio Flores Carvalho*[b], *Janina Eden*[c], *Daniele Dondossola*[d], *Philipp Dutkowski*[c] and *Andrea Schlegel*[b,c,d]



	Oxygen	Temperature	e⁻ - flow	Succinate	NADH	ATP	ROS
Ischemia/ Hypoxia	Hypoxia	Warm / cold	stopped	accumulated	high	low	Limited to none
Normothermic Reperfusion	oxygenated	35-37°	Reversed, undirected	rapid decrease	slow decrease/ remaining plateau	Low to intermediate	Intermediate to high
Hypothermic Reperfusion	oxygenated	4-12°	Re-activated, forward flow	slow decrease	steady decrease	high	low

CURRENT OPINION IN ORGAN TRANSPLANTATION

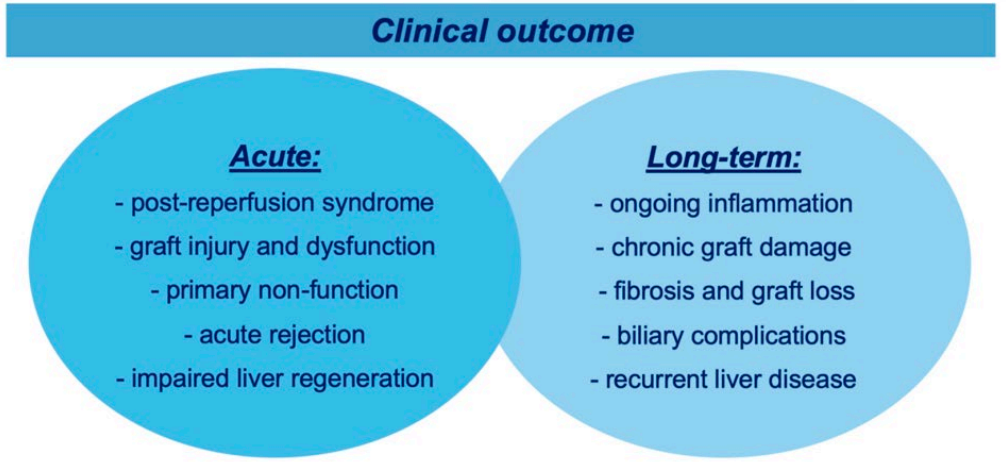
Current Opinion in Organ Transplantation 27(5):p 434-445, October 2022.



Review

Ischemia-Reperfusion Injury in Marginal Liver Grafts and the Role of Hypothermic Machine Perfusion: Molecular Mechanisms and Clinical Implications

Zoltan Czigany [1,†], Isabella Lurje [2,†], Moritz Schmelzle [2], Wenzel Schöning [2], Robert Öllinger [2], Nathanael Raschzok [2], Igor M. Sauer [2], Frank Tacke [3], Pavel Strnad [4], Christian Trautwein [4], Ulf Peter Neumann [1], Jiri Fronek [5], Arianeb Mehrabi [6], Johann Pratschke [2], Andrea Schlegel [7,†] and Georg Lurje [1,2,*,†]



J. Clin. Med. **2020**, *9*, 846; doi:10.3390/jcm9030846

Hypothermic Machine Preservation in Human Liver Transplantation: The First Clinical Series

Jul 2004 – Feb 2008
MELD < 35
CIT > 4h
Travel time < 3h
DBDs
Donor age < 65yo
Steatosis (macro) < 25%

Dual cannulation
Perfusion time 3 – 7 hours
(Total CIT < 12h)
Perfusion Vasosol®
Hypothermia 4-8 ºC
Without oxygenation

	20	20
	Machine perfusion (HMP)	Cold storage (CS)
Primary nonfunction	0	0
Early allograft dysfunction	1* (5%)[1]	5 (25%)
Vascular complications (total)	0	1
Hepatic artery stenosis		1
Biliary complications (total)	2	4
Early bile leak	1	1
Biliary stricture	1	3
Hospital length of stay (days)	10.9 ± 4.7[2]	15.3 ± 4.9
Actual graft and patient survival	18/20 (90%)	18/20 (90%)
Deaths with fuctional grafts	2 Cardiovascular death at 1 month Pneumonia and sepsis at 3 months	2 Recurrent cancer at 5 months Recurrent HCV and sepsis at 7 months

[1]p = 0.08, [2]p = 0.006.
*Technically met criteria but occurred in the setting of early acute cellular rejection.

Guarrera J; **AJT**, 2010

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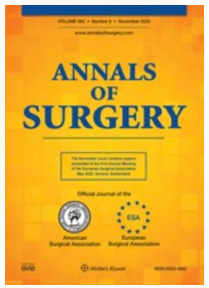


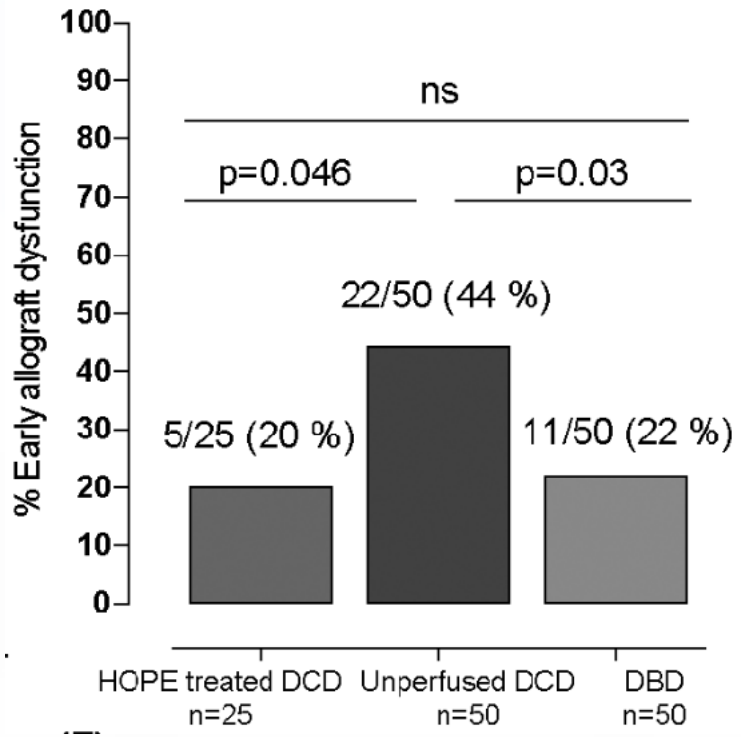
First Comparison of Hypothermic Oxygenated PErfusion Versus Static Cold Storage of Human Donation After Cardiac Death Liver Transplants

An International-matched Case Analysis

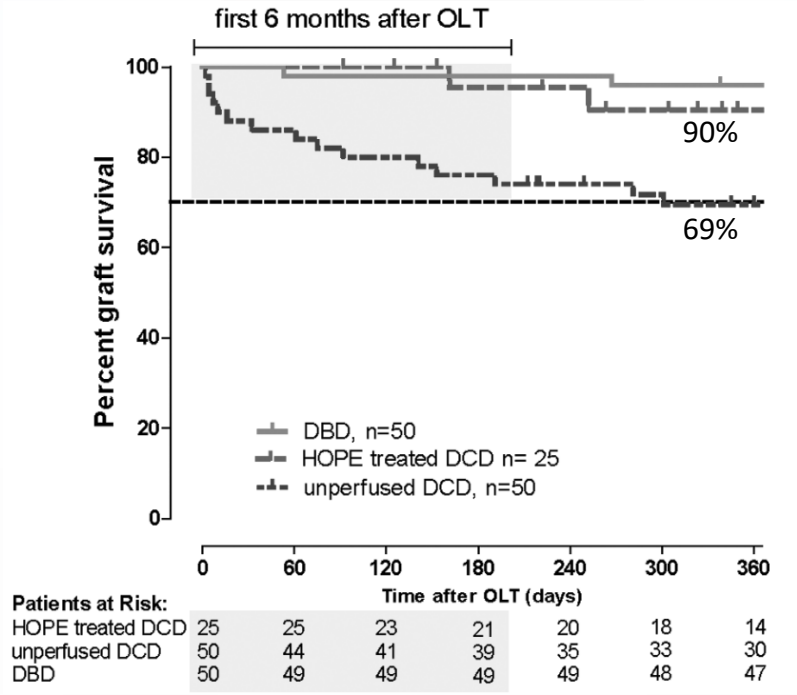
Philipp Dutkowski, MD, Wojciech G. Polak, MD, PhD,† Paolo Muiesan, MD,‡ Andrea Schlegel, MD,* Cornelia J. Verhoeven,† Irene Scalera, MD,‡ Michelle L. DeOliveira, MD,* Philipp Kron, MD,* and Pierre-Alain Clavien, MD, PhD, FACS (Hon)**

Jan 2012 – Dec 2014
Matching 1:2
WIT ± 4 min
BAR score ± 5p
Cold storage < 8h

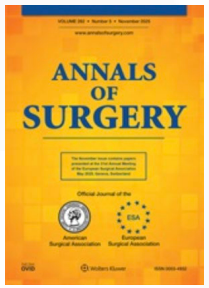
Single (portal) cannulation
Md Perf.time 119m
Perfusion wUW
Hypothermia 10 ºC
pO2 80 – 100 kPa



1y graft-srv



Annals of Surgery • Volume 262, Number 5, November 2015



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Without NRP

Jan 2012 – Dec 2014
Matching 1:2
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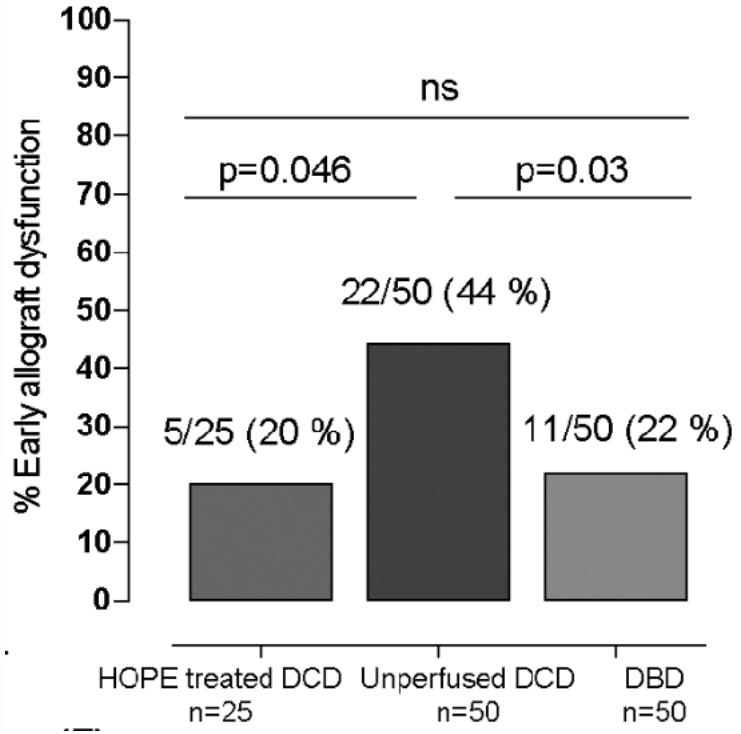

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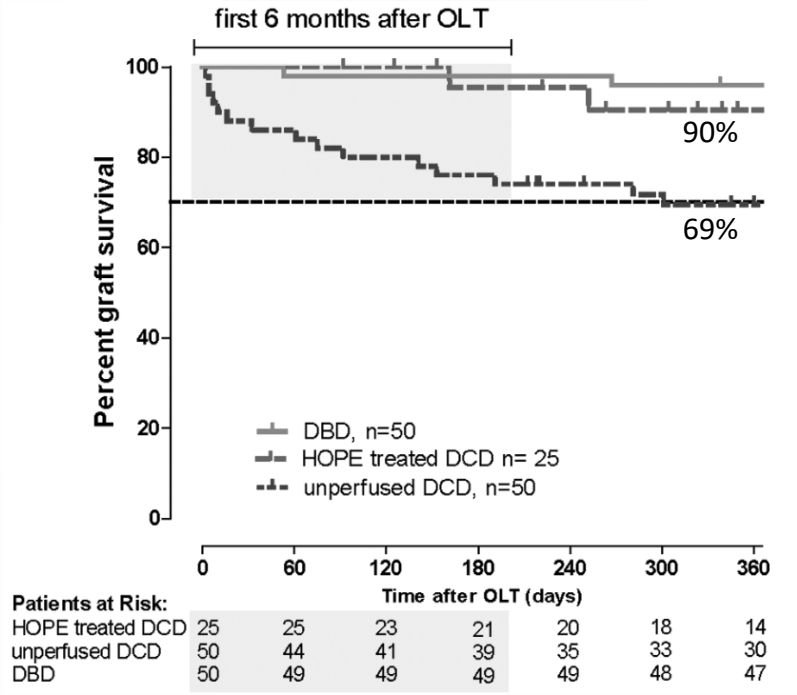

Annals of Surgery • Volume 262, Number 5, November 2015

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 APRIL 15, 2021 VOL. 384 NO. 15

DCDs
D-HOPE vs SCS

Hypothermic Machine Perfusion in Liver Transplantation — A Randomized Trial

R. van Rijn, I.J. Schurink, Y. de Vries, A.P. van den Berg, M. Cortes Cerisuelo, S. Darwish Murad, J.I. Erdmann, N. Gilbo, R.J. de Haas, N. Heaton, B. van Hoek, V.A.L. Huurman, I. Jochmans, O.B. van Leeuwen, V.E. de Meijer, D. Monbaliu, W.G. Polak, J.J.G. Slangen, R.I. Troisi, A. Vanlander, J. de Jonge, and R.J. Porte, for the DHOPE-DCD Trial Investigators*

Outcome	Machine Perfusion (N=78)	Control (N=78)	Treatment Effect (95% CI)	P Value
Primary end point†				
Nonanastomotic biliary strictures — no. (%)	5 (6)	14 (18)		0.03
Unadjusted risk ratio			0.36 (0.14 to 0.94)	0.03
Adjusted risk ratio			0.35 (0.14 to 0.92)	0.03
Secondary end points				
Postreperfusion syndrome				
>30% decrease in systemic mean arterial pressure — no./total no. (%)	9/72 (12)	19/70 (27)	0.43 (0.20 to 0.91)‡	
>30% decrease in systemic mean arterial pressure or ≥100% increase in norepinephrine dose — no./total no. (%)	20/72 (28)	33/72 (46)	0.59 (0.38 to 0.92)‡	
Serum potassium after reperfusion — mmol/liter§	4.1±0.7	4.4±1.1	−0.4 (−0.1 to −0.6)	

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 APRIL 15, 2021 VOL. 384 NO. 15

Without NRP

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Article

Hypothermic Oxygenated Machine Perfusion (HOPE) Prior to Liver Transplantation Mitigates Post-Reperfusion Syndrome and Perioperative Electrolyte Shifts

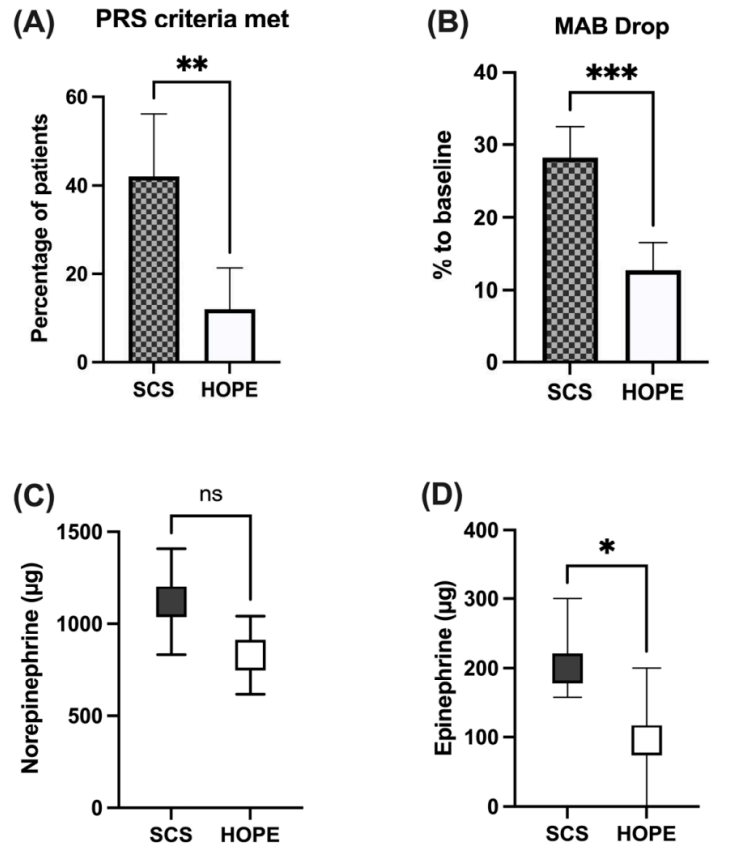
Fabian Horné †, Moritz Drefs †, Malte Joachim Schirren, Dominik Thomas Koch, Ganildo Cepele, Severin Johannes Jacobi, Elnaz Payani, Nikolaus Börner, Jens Werner, Markus Otto Guba and Dionysios Koliogiannis *

Retrospective matched-controlled analysis (DBDs):

50 HOPE 2020 - 2021

50 SCS 2018 - 2019

Recipient Characteristics and Control Variables at Date of Liver Transplantation	All, N (%)/Mean [95% CI]	Liver Graft Preservation Techniques -SCS- N (%)/Mean [95% CI]	-HOPE- N (%)/Mean [95% CI]	*p*-Value (HOPE vs. SCS)
Early allograft dysfunction (EAD)				**0.04**
EAD	39 (39.0%)	25 (50.0%)	14 (28.0%)	
No EAD	61 (61.0%)	25 (50.0%)	36 (72.0%)	
Primary Non Function (PNF)				0.24
PNF	3 (3.0%)	3 (3.0%)	0 (0.0%)	
No PNF	97 (97.0%)	47 (47.0%)	50 (50.0%)	
30-day Survival				0.36
Survival	96 (96.0%)	47 (94%)	49 (98%)	
No Survival	4 (4.0%)	3 (6.0%)	1 (2.0%)	
Total	100 (100%)	50 (50.0%)	50 (50.0%)	



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50 HOPE 2020 - 2021

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WIT 55’
CIT > 600’

Recipient Characteristics and Control Variables at Date of Liver Transplantation	All, N (%)/Mean [95% CI]	Liver Graft Preservation Techniques -SCS- N (%)/Mean [95% CI]	-HOPE- N (%)/Mean [95% CI]	*p*-Value (HOPE vs. SCS)
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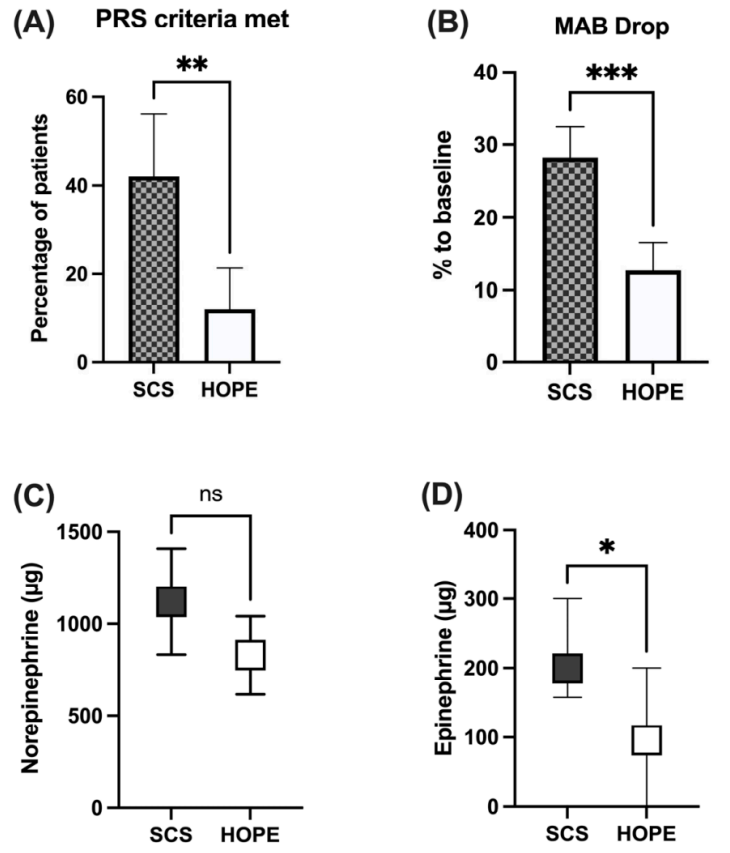

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liver transplantation AND hipothermic oxygenated machine perfusion

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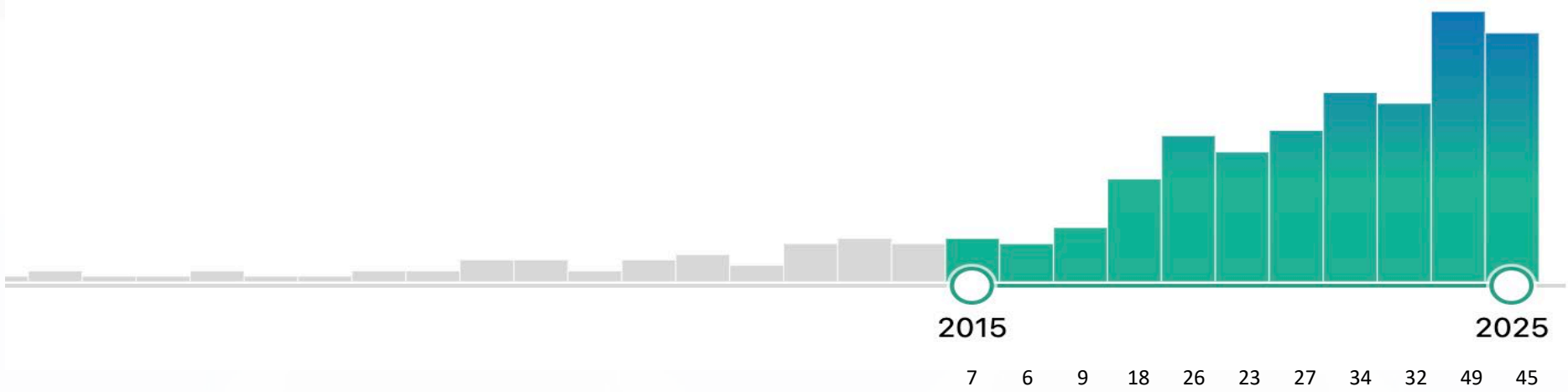

El camino del HOPE

- Desequilibrio pacientes en lista / injertos disponibles → Uso de injertos subóptimos
  - Más susceptibles lesión por isquemia – reperfusión (isquemia fría)
  - Mayor riesgo de complicaciones postoperatorias / pérdida del injerto

Edad donante
Obesidad y Sd Metabólico (Esteatosis)
Criterios Expandidos en DCD

- Estrategias: Perfusión dinámica (oxigenación) → Hipotermia → Mejoría resultados
  - Disfunción precoz injerto (EAD)
  - Complicaciones graves (CD>IIIA)
  - Complicaciones biliares
  - Estancia hospitalaria

Czigany, 2021
Ravaioli, 2022
Schlegel, 2023
Van Rijn, 2021

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MINISTERIO
DE SANIDAD

Organización Nacional de Trasplantes

CIRCULAR Nº 4/2022 – ORGANIZACIÓN NACIONAL DE TRASPLANTES

OBJETO: Tecnologías de perfusión exvivo en trasplante hepático en centros regionales experimentados

DESTINATARIOS: Coordinadores Autonómicos de Trasplante, Coordinadores Hospitalarios de Trasplante, Equipos de Trasplante Hepático

FECHA: 27 de abril de 2022

Conscientes del elevado coste económico que puede repercutir en el sistema sanitario la adquisición de estos dispositivos en cada uno de los hospitales con programa de trasplante hepático activo, la Comisión de Trasplantes insta a los responsables de las unidades españolas de trasplante hepático a descartar iniciativas unicéntricas en aras de potenciar en todo caso la creación de centros regionales de recuperación de injertos hepáticos que acumulen experiencia y casuística y den servicio a las unidades de trasplante de una comunidad autónoma o región determinada. Dichas iniciativas han de ser canalizadas a través de la correspondiente coordinación autonómica de trasplantes.

seth
SOCIEDAD ESPAÑOLA DE TRASPLANTE HEPÁTICO

POSICIONAMIENTO DE LA SETH SOBRE
LA PERFUSIÓN EXVIVO EN TRASPLANTE HEPÁTICO
28 de junio de 2022

La finalidad de su utilización se plantea con tres objetivos principales:

1) Optimizar los resultados del uso de donantes con criterio expandido.

2) Recuperar para el TH órganos inicialmente descartados.

3) En menor medida, optimizar la logística en algunos trasplantes.

Consideraciones:

- Establecer criterios de uso → definir escenarios
- Cada Centro o CA debe establecer la logística óptima
- Desarrollo de alianzas intercentros
- Desarrollar un registro prospectivo

Aparición en España. Desafíos.

17 noviembre 2021

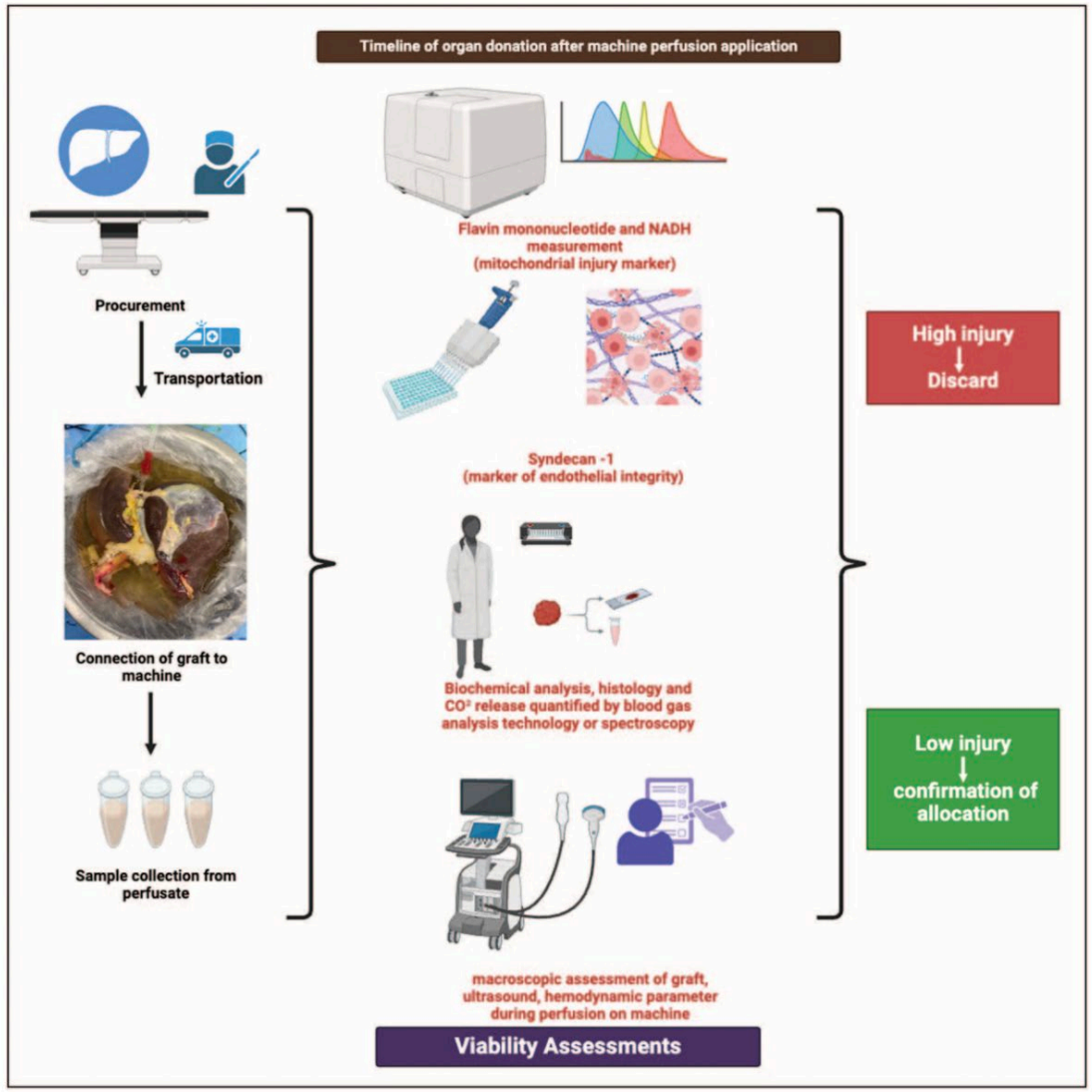
20 febrero 2022

Aparición en España. Desafíos.

PRINCIPALES RETOS:

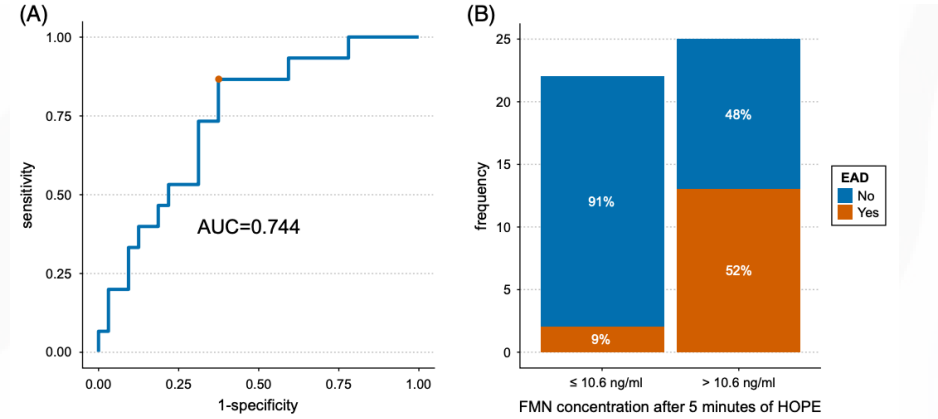
Complejidad logística y técnica	→ Dispositivos de perfusión especializados → Personal Cualificado → Tiempo adicional
Coste y asignación de recursos	→ Consumibles → Justificación de la rentabilidad
Evaluación de la viabilidad limitada	→ Análisis limitado del FMN
Estandarización y variabilidad del protocolo	→ Heterogeneidad protocolos: parámetros de duración, perfusato, O2, Ta
Evidencia e indicaciones	→ Reducción lesión por isquemia – reperfusión → *Endpoint?* → Reducción complicaciones biliares → Lagunas: • Largo plazo • Selección receptores (DCD>DBD, prolonged CIT…)

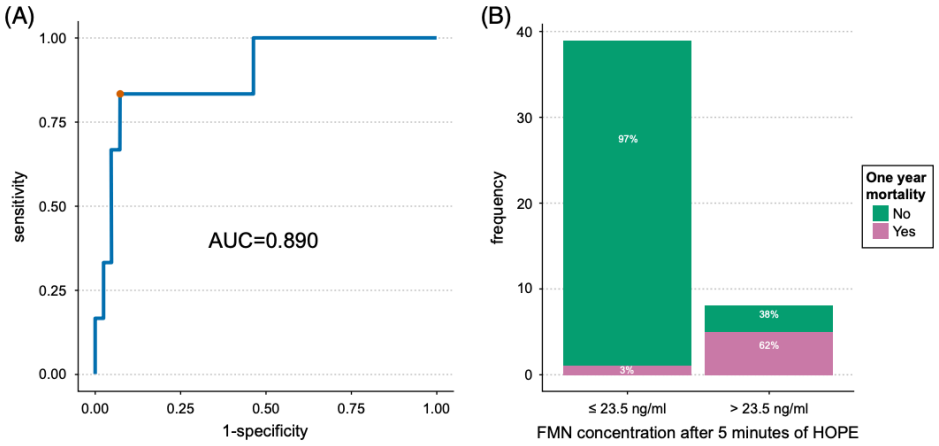
Parente A, J Hepatol 2023
Tang G, Int J Surg 2024



Yildirim FS,…Schlegel A. *Curr Opin Organ Transplant*, 2025

Validation of mitochondrial FMN as a predictor for early allograft dysfunction and patient survival measured during hypothermic oxygenated perfusion





Dingfelder J,…Györi GP. Liver Transplantation, 2025

Aparición en España. Desafíos.

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Machine perfusion techniques for liver transplantation - A meta-analysis of the first seven randomized-controlled trials

Authors

Alessandro Parente, Fabio Tirotta, Alessia Pini, …, Tommaso M. Manzia, Philipp Dutkowski, Andrea Schlegel

Study, year, Ref.	Centers	No. of centers	Countries (n)	Type of randomization	Time of randomization	Study Period	Number of transpl-antations	Perfusion type	Perfusion device & perfusate	Static cold storage before perfusion (h)	Perfusion modality	Perfusion conditions	Perfusion duration (h)	Donor type
Hypothermic oxygenate perfusion (HOPE)														
Van Rijn *et al.*, 2021[10]	Multicentre	6	Netherlands (3) Belgium (2) UK (1)	Computer generated	At donor liver acceptance by recipient surgeon	01/2016 – 07/2019	D-HOPE: 78, SCS: 78	D-HOPE	Liver Assist®; Belzer MPS with Glutathione	6.2 (5.3-6.9)	Dual	T: 10 °C Pressure: PV 5 mmHg, HA: 25 mmHg	2 (2-2.6)	DCD
Czigany *et al.*, 2021[11]	Multicentre	4	Germany (3) Czech Republic (1)	Web-generated	After procurement, at recipient center	09/2017 – 09/2020	HOPE: 23, SCS: 23	HOPE	Liver Assist®; Belzer MPS	6.3 (5.2-7.8)	Single PV	T: 10 °C Pressure: PV 3-5mmHg	2.4 (1.7-3.4)	ECD-DBD
Ravaioli *et al.*, 2022[12]	Single	1	Italy	Computer generated	Before procurement	12/2018 – 01/2021	HOPE: 55, SCS: 55	HOPE	Vitasmart™; Belzer MPS	4.3 (3.6-5.4)	Single PV	T: 10 °C Pressure: PV 3 mmHg	2.4 (2-3)	ECD-DBD
Schlegel *et al.*, 2023[14]	Multicentre	10	UK (3) Belgium (2) France (2) Austria (1) Netherlands (1) Switzerland (1)	Computer generated	After procurement, at recipient center	04/2015 – 08/2019	HOPE: 85, SCS: 85	HOPE	Liver Assist®; Belzer MPS	6.2 (5-7.9)	Single PV	T: 8-12 °C Pressure: PV 3 -4 mmHg Flow: 150-205 ml/min	1.6 (1.3-2.3)	ECD-DBD

Machine perfusion techniques for liver transplantation - A meta-analysis of the first seven randomized-controlled trials

Authors

Alessandro Parente, Fabio Tirotta, Alessia Pini, …, Tommaso M. Manzia, Philipp Dutkowski, Andrea Schlegel

Outcome, No. of participants (studies)	Relative risk (95% CI)	Anticipated absolute effects (95% CI)			Certainty	Interpretation
		Static cold storage	Hypothermic oxygenated perfusion	Difference		
Early allograft dysfunction No. of participants: 482; (4 RCTs)	RR 0.48 (0.35 to 0.65)	40.2%	19.3% (14.1 to 26.2)	20.9% fewer (209 fewer per 1,000; 26.2 fewer to 14.1 fewer)	⨁⨁⨁⨁ High	Hypothermic oxygenated perfusion results in large reduction in early allograft dysfunction.
Duration of hospital stay assessed with: days No. of participants: 482; (4 RCTs)	—	The mean duration of hospital stay was **23.6** days	—	MD **4.26 days lower** (7.98 lower to 0.55 higher)	⨁⨁◯◯ Low[a]	Hypothermic oxygenated perfusion may result in a reduction in duration of hospital stay. However, results need to be interpreted with caution given the heterogeneity of data and low level of evidence.
Overall biliary complications No. of participants: 482; (4 RCTs)	**RR 0.78** (0.60 to 1.02)	31.5%	**24.6%** (18.9 to 32.2)	**6.9% fewer** (69 fewer per 1,000; 12.6 fewer to 0.6 more)	⨁⨁⨁◯ Moderate[b]	Hypothermic oxygenated perfusion likely results in a reduction in overall biliary complications. One trial was conducted utilizing only DCD livers, which might have limited the robustness of the results.
Non-anastomotic biliary strictures No. of participants: 436; (3 RCTs)	**RR 0.43** (0.20 to 0.93)	9.6%	**4.1%** (1.9 to 9)	**5.5% fewer** (55 fewer per 1,000; 7.7 fewer to 0.7 fewer)	⨁⨁⨁◯ Moderate[b]	Hypothermic oxygenated perfusion results in a reduction in non-anastomotic biliary strictures. One trial was con ducted utilizing only DCD livers, which might have limited the robustness of the pooled results.
Major complications (Clavien Grade ≥IIIb) No. of participants: 482; (4 RCTs)	**RR 0.76** (0.63 to 0.93)	48.5%	**36.9%** (30.6 to 45.1)	**11.7% fewer** (117 fewer per 1,000; 18 fewer to 3.4 fewer)	⨁⨁⨁◯ Moderate[c]	Hypothermic oxygenated perfusion reduces major complications (Clavien Grade ≥IIIb).
Graft loss at 1 year No. of participants: 326; (3 RCTs)	**RR 0.40** (0.17 to 0.95)	11.7%	**4.7%** (2 to 11.1)	**7.0% fewer** (70 fewer per 1,000; 9.7 fewer to 0.6 fewer)	⨁⨁⨁⨁ High	Hypothermic oxygenated perfusion reduces graft loss at one year. This result has important implication, and it is considered to be relevant.
Re-transplantation at 1 year No. of participants: 326; (3 RCTs)	**RR 0.21** (0.04 to 0.96)	7.4%	**1.5%** (0.3 to 7.1)	**5.8% fewer** (58 fewer in 1,000; 7.1 fewer to 0.3 fewer)	⨁⨁⨁◯ Moderate[d]	Hypothermic oxygenated perfusion likely reduces the need for re-transplantation. The wide range of the confidence interval and the small number of events, might have limited the robustness of this result.

Journal of Hepatology, **November 2023**. vol. 79 | 1201–1213

Original Article

A French multicenter randomized-controlled trial of hypothermic oxygenated perfusion in extended criteria donor liver transplantation (HOPExt)

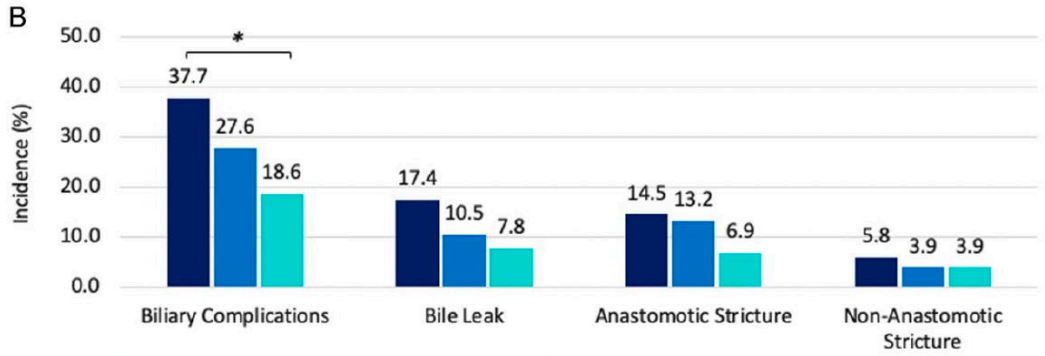
Mickaël Lesurtel MD, PhD [1], Kayvan Mohkam MD, PhD [2], Marc-Antoine Allard MD, PhD [3], René Adam MD, PhD [3], Fabien Robin MD, PhD [4], Michel Rayar MD, PhD [4], Karim Boudjema MD, PhD [4], Alexandre Chebaro MD [5], Emmanuel Boleslawski MD, PhD [5], Eric Savier MD [6], Olivier Scatton MD, PhD [6], Edouard Girard MD, PhD [7], Mircea Chirica MD, PhD [7], Safi Dokmak MD, PhD [1], Olivier Soubrane MD, PhD [1], Francois Faitot MD, PhD [8], Philippe Bachellier MD [8], Valérie Hervieu MD [9], Pascale Guerre PhD [10 11], Jamal Atfeh PharmD [10 12] ...Jean-Yves Mabrut MD, PhD [2]

2019 – 2023
DBDs
Extended Criteria Donors
131 HOPE vs 131 SCS
Early Allograft Dysfunction
8 Centers

EAD	17.6% vs 30.5%, p=0.01
Clavien > IIIA	61.5% vs 52.4%, p=0.15
CCI	49[34-65] vs 46 [35-65], p=0.78
90dMRT	5.3% vs 2.3%, p=0.20
Ischemic Cholangiopathy (1y)	4.9% vs 3.3%, p=0.71

Dual hypothermic oxygenated machine perfusion of the liver reduces post-transplant biliary complications: a retrospective cohort study

David Pereyra, MD, PhD[a,b], Jule Dingfelder, MD[a,b], Moriz Riha[a], Sertac Kacar, MD[a], Laurin Rauter, MSc[a], Nikolaus Becker[a], Tina Saffarian Zadeh[a], Chiara Tortopis[a], Patrick Starlinger, MD, PhD[b,c], Robin Ristl, PhD[d], Gerd Silberhumer, MD[b], Andreas Salat, MD[a], Thomas Soliman, MD[a], Gabriela Berlakovich, MD[a], Georg Gyoeri, MD[a]



Pereyra et al. International Journal of Surgery (2024)

Single versus dual hypothermic oxygenated perfusion in liver transplantation: a call for risk-matched outcome analyses

Omer F. Karakaya, MD[a], Sangeeta Satish, MD[a,b], Philip C Müller, MD[c], Philipp Dutkowski, MD[c], Andrea Schlegel, MD, MBA[a,b,*]

Overview on current literature on effect of single and dual HOPE on biliary complications in clinical studies with liver transplantation

Type of study, center (n)	Author, year (location)	Graft type, cohort (n)	Perfusion duration (median)	Duration of follow-up	Primary outcome and main findings	Anastomotic biliary strictures	Non-anastomotic biliary strictures	Discussion/ limitations
					sHOPE			
RCT, Multicenter (10)	Schlegel *et al* (Switzerland, France, Netherlands, UK, Belgium, Austria)[4]	DBD/ECD • SCS (85) • sHOPE (85)	95.5 min	12 months	• Primary outcome: no statistical difference in incidence of 1 or more Clavien Dindo complications ≥ 3 with sHOPE • No liver-related graft loss and retransplantation with sHOPE • Less EAD compared to SCS cohort (% liver-related graft complication rate)	SCS:21.2% (n = 18/85) sHOPE: 16.5% (n = 14/85)	SCS: 3.5% (n = 3/85) sHOPE: 1.2% (n = 1/85, no graft loss, conservative treatment)	sHOPE was associated with fewer severe liver-related complications (Clavien > IIIb) in DBD grafts. Further studies are recommended to confirm these findings. No DCD grafts used
RCT, single center	Ravaioli *et al* (Italy)[9]	DBD/ECD • SCS (55) • sHOPE (55)	145 min	12 months	• Primary outcome: lower EAD (13% vs 35%, $P = 0.007$) with sHOPE • No PNF, higher 1-year graft survival ($P = 0.03$) in sHOPE cohort • Lower readmission and overall complication ($P = 0.04$ and $P = 0.03$, respectively) compared to SCS	Hepatic Biliary or Vascular complications; sHOPE: 16% (n = 9/55), SCS: 22% (n = 12/55)		No DCD livers, combined presentation of biliary and vascular complications; Biliary complications not further investigated for AS, NAS
RCT, multicenter (4)	Czigany *et al* (Germany, Czech Republic)[10]	DBD/ECD • SCS (23) • sHOPE (23)	145 min	12 months	• Primary outcome: statistically significant reduction in peak ALT levels within 7 days ($P = 0.03$) • Shorter ICU and hospital stay ($P = 0.045$ and $P = 0.002$, respectively) with sHOPE • Less major complications and cumulative complications ($P = 0.036$ and CCI $P = 0.021$), lower estimated costs after transplantation ($P = 0.016$) in sHOPE compared to SCS	Biliary complications (clinical; radiological): SCS: 26% (n = 6/23), sHOPE: 17% (n = 4/23)		Study was not powered for biliary complications, No DCD livers, no specific information on NAS
Retrospective, multicenter (17)	Schlegel *et al* (Europe and North America)[a]	DCD (2,219) (Benchmark/Low-risk 1,012) • SCS (87) • sHOPE (49)	120 min	12 months	• Significantly reduced non anastomotic biliary strictures ($P = 0.0071$) with sHOPE	SCS: 22.1%, sHOPE: 26.5%	SCS: 22.06%, sHOPE: 4.1% ($P = 0.0071$)	Further prospective studies are needed to confirm benchmark efficacy

(*Continued*)

Karakaya et al. International Journal of Surgery (2025)

Research Article
Liver Transplantation

JOURNAL OF HEPATOLOGY

Utilization of livers donated after circulatory death for transplantation – An international comparison

Table 1. Regulatory framework and national guidelines for DCD-III liver transplantation.

Countries	National legislation legally binding	National guidelines non-legally binding	Cut-off donor age (yr)	Cut-off time waited by recovery teams (h)	Stand-off period (min)	Start of functional donor warm ischemia time	Cut-off functional donor warm ischemia time (min)	Cut-off cold ischemia (h)	Preservation protocol
Belgium	Yes	Yes	≤70	≤1	5	SBP <50 mmHg or SpO_2 <70%	≤30	–	SRR + cold storage; (NRP + cold storage)‡
France	Yes	Yes	≤71	≤3	5	SBP <45 mmHg	≤45 (asystolic DWIT <30)	≤8	NRP + cold storage
Italy	No	Yes	–	–	20	SBP <50 mmHg or SpO_2 <70%	≤60	–	NRP + cold storage + HOPE (NRP + cold storage)
Netherlands	Yes	Yes	≤60	≤2	5	SBP <50 mmHg or SpO_2 <70%	≤30	–	SRR + cold `storage ± HOPE; (±controlled oxygenated rewarming (COR)) (NRP + cold storage)
Spain	Yes	Yes	≤90**	≤2	5	SBP <60 mmHg	≤30	–	NRP + cold storage; (SRR + cold storage [regional])
Switzerland	No	Yes	–	≤2	5 (10)	MAP <50 mmHg	–	–	SRR + cold storage + HOPE; NRP + cold storage ± HOPE
United Kingdom	Yes	Yes	≤80	≤4 (1)	5	SBP <50 mmHg or SpO_2 70%	≤30	–	SRR + cold storage; NRP + cold storage; (SRR + cold storage + HOPE)
United States	Yes	Yes	≤65*	≤1–3	2–5	MAP <60 mmHg	20–30 min (total DWIT 60–90 min)	—	SRR + cold storage; (SRR + cold storage + NMP or HOPE/HMP; NRP + cold storage)

Eden J. *J Hepatol*, 2023

Research Article
Liver Transplantation

JOURNAL OF HEPATOLOGY

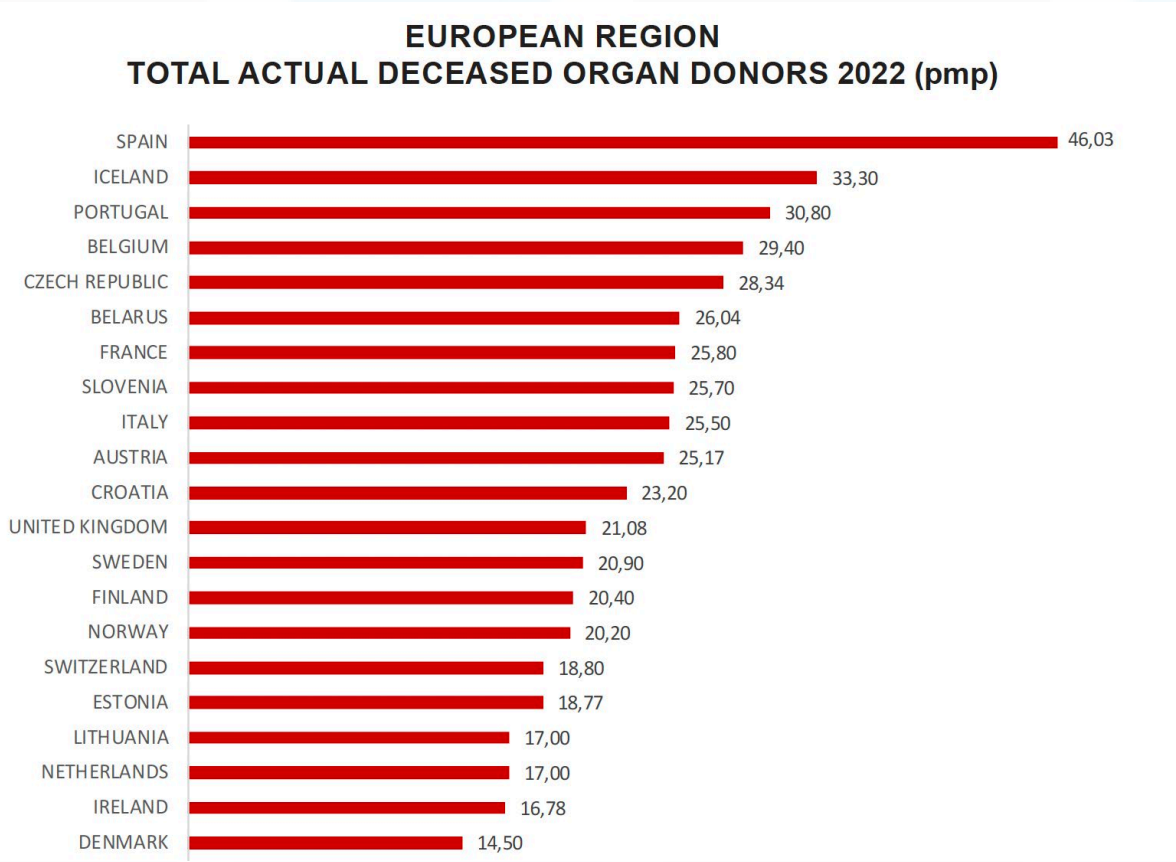
Utilization of livers donated after circulatory death for transplantation – An international comparison

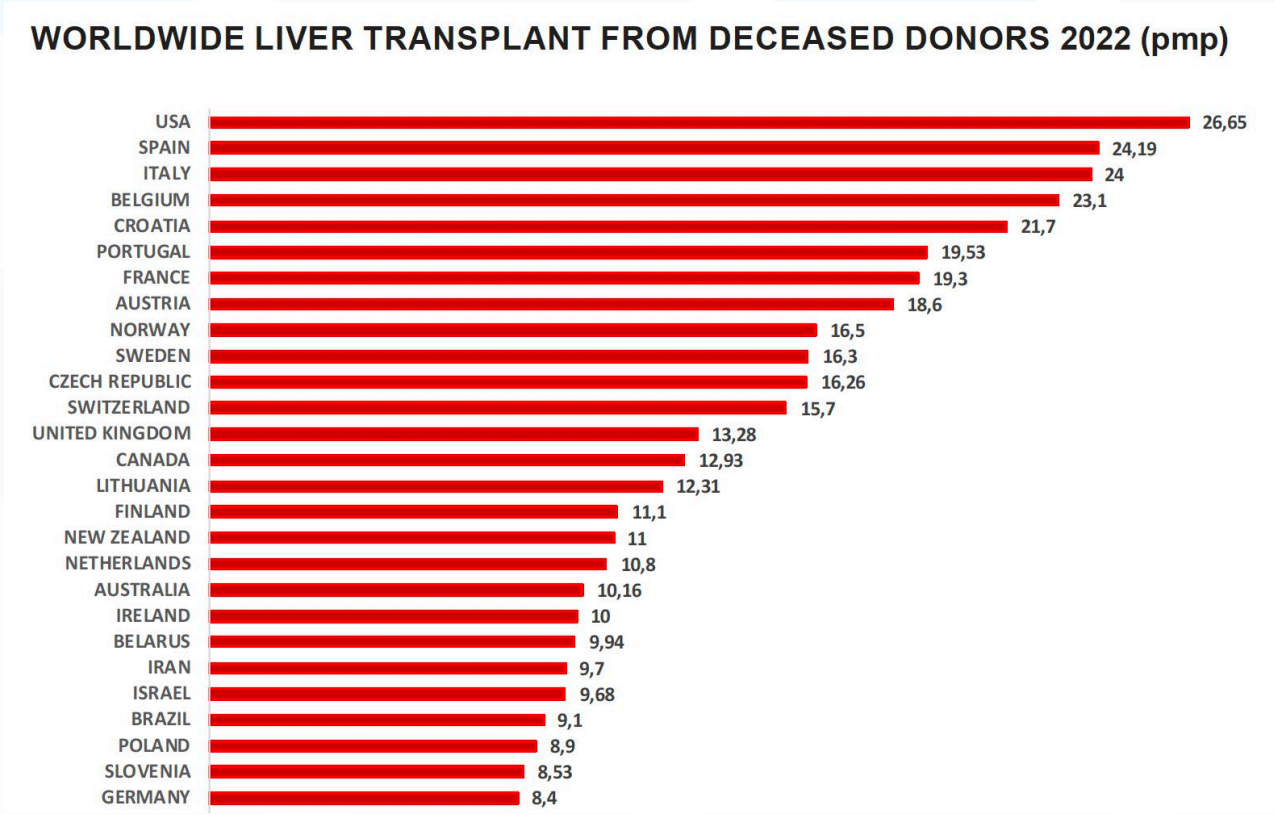
Table 2. DCD-III demographics.

Countries	Population	Donors/ million	Total liver transplants/yr*	DCD liver transplants/yr*	Total liver transplants/ yr/million*	% overall DCD Maastricht Type-III*
Belgium	11,584,008	28	238	103	20.5	43.3%
France	65,573,195	23.2	1,310	130	19.9	10%
Italy	60,461,826	21.5	1,092	37	18.2	1.7%
Netherlands	17,213,537	14.9	153	76	8.9	49.7%
Spain	46,792,350	40.2	1,078	288	22.7	26%
Switzerland	8,654622	16.8	151	39	18.9	26.7%
United Kingdom	67,461,826	18.4	776	130	11.6	20.8%
United States	331,003,651	38	9,236	830	27.9	6.1%

Eden J. *J Hepatol*, 2023

Aparición en España. Desafíos.



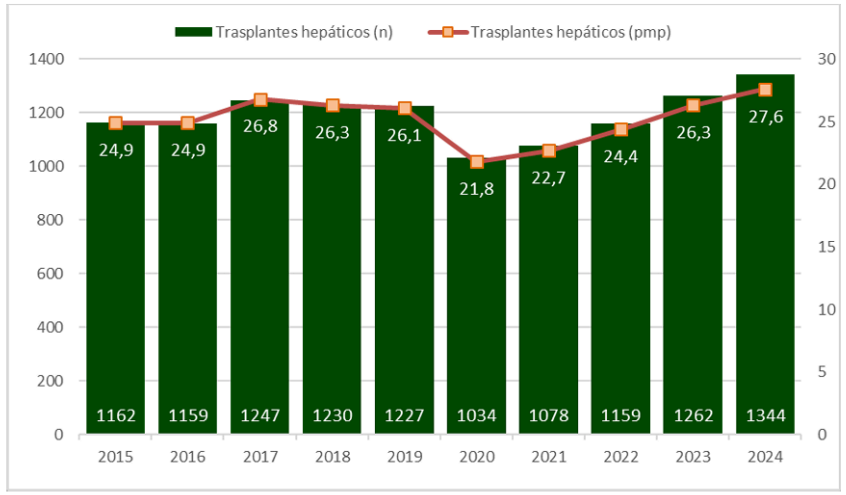


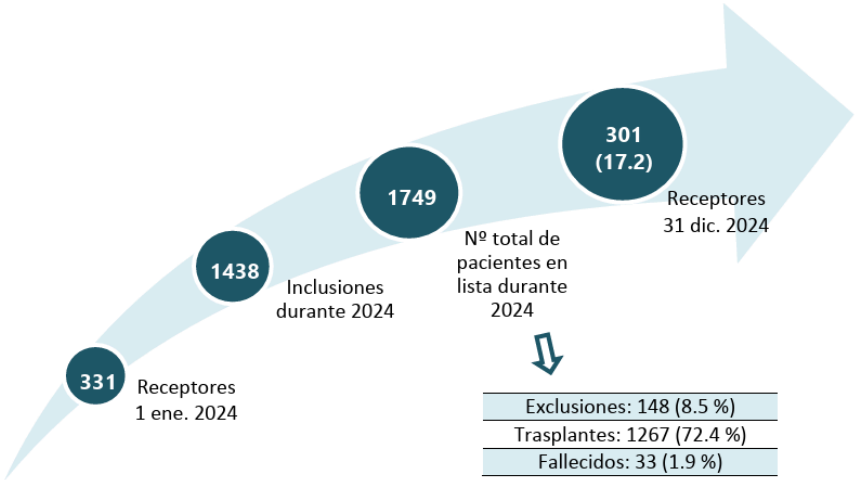
International Registry of Organ Donation and Transplantation, 2023

@SETHepatico

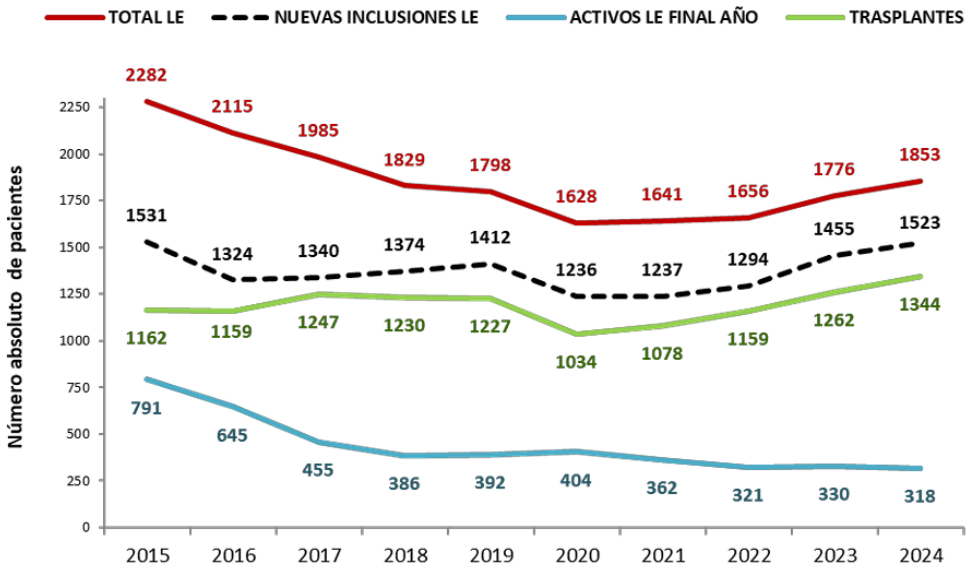
Aparición en España. Desafíos.

Anexo 7. **Actividad de trasplante hepático. España 2015-2024.**

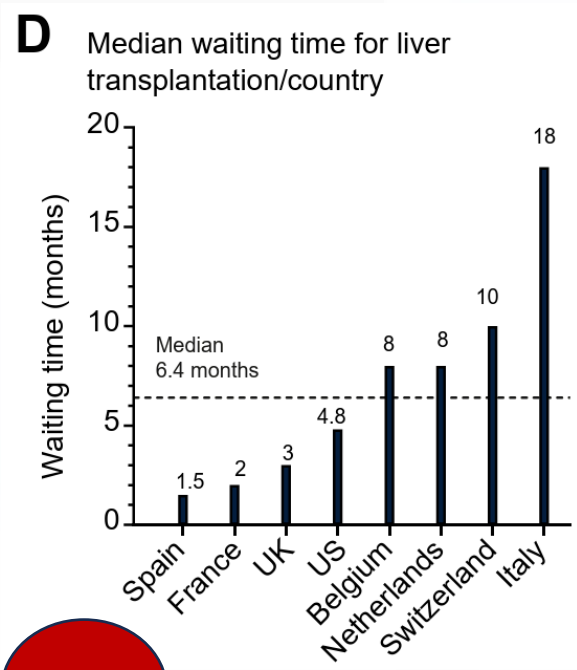




Evolución de lista de espera para trasplante hepático durante 2024. ADULTOS.



Registro Español de Trasplante Hepático, 2024



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Eden J. *J Hepatol*, 2023

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MINISTERIO
DE SANIDAD

Organización Nacional de Trasplantes, O.A.

CIRCULAR Nº 5/2024 – ORGANIZACIÓN NACIONAL DE TRASPLANTES

OBJETO: Tecnologías de perfusión exvivo en trasplante hepático.

DESTINATARIOS: Coordinadores Autonómicos de Trasplante, Coordinadores Hospitalarios de Trasplante, Equipos de Trasplante Hepático.

FECHA: 02 de agosto de 2024

Por todo ello, LA COMISIÓN DE TRASPLANTES DEL CIT-SNS ACUERDA, en su reunión ordinaria de 29 de mayo de 2024, LIBERALIZAR EL USO DE LA MÁQUINA DE PRESERVACIÓN HEPÁTICA EX-VIVO EN HIPOTERMIA PARA LA OPTIMIZACIÓN DE INJERTOS VÁLIDOS PARA TRASPLANTE –cuya utilización no afecta a los criterios de distribución hepática- y deja la decisión respecto de la recuperación de órganos no trasplantables con PERFUSIÓN EX-VIVO EN NORMOTERMIA pendiente de la aprobación de la estrategia nacional. En cualquier caso, este acuerdo ESTARÁ SUPEDITADO en cada Comunidad Autónoma a las indicaciones de cada Coordinación Autonómica de Trasplantes.

Aparición en España. Desafíos.

XVIVO

Córdoba	H.U. Reina Sofía
Barcelona	H.U. Clínic
Madrid	H.U. 12 de Octubre
Madrid	H.U. Puerta de Hierro

BRIDGE TO LIFE™

Valladolid	H.U. Río Hortega
Barcelona	H.U. Bellvitge
Sevilla	H.U. Virgen del Rocío
Barcelona	H.U. Vall d'Hebrón
Valencia	H.U. La Fe
Badajoz	H.U. Badajoz
Santiago	Complejo H.U. Santiago de Compostela
A Coruña	Complejo H.U. A Coruña
Madrid	H.U. 12 de Octubre
Madrid	H.U. Gregorio Marañón
Madrid	H.U. La Paz (pediátrico)
Pamplona	Clínica U. Navarra
Bilbao	H.U. Cruces

INDICE

- El camino del HOPE.
- Aparición en España. Desafíos.
- Evidencia actual.
- Experiencia inicial en España.

ESTUDIO COMPARATIVO DEL USO DE INJERTOS MANTENIDOS EN OXIGENACIÓN HIPOTÉRMICA FRENTE A FRÍO ESTÁTICO EN TRASPLANTE HEPÁTICO: EXPERIENCIA INICIAL EN ESPAÑA

Luis Secanella, Luis Miguel Marín, Irene Aguirrezabalaga, Alberto Pueyo, Mireia Caralt, Diego López, Beatriz Vellido, Javier Tejero, Laura Lladó

Multicéntrico HOPE España. Material y Método.

Análisis descriptivo de injertos sometidos a reoxigenación en hipotermia (HOPE):

- Resultados a corto plazo de los pacientes trasplantados mediante injertos HOPE
- Estudio comparativo frente pacientes trasplantados con injertos mantenidos mediante frío estático (SCS).

Objetivos Primarios

- Incidencia Síndrome Reperfusión (SRP) injertos HOPE → Comparativa HOPE vs SCS

Objetivos Secundarios

- Incidencia EAD / PNF injertos HOPE
- Incidencia complicaciones graves (Clavien > IIIA) injertos HOPE → Comparativa HOPE vs SCS
- Incidencia colangiopatía isquémica injertos HOPE

Multicéntrico HOPE España. Material y Método.

TIPO ESTUDIO

Cohorte Apareada, Retrospectiva

Multicéntrico → SETH

Período inclusión → Enero 2022 a diciembre 2023

Período seguimiento mínimo → 6 meses

Estudio Factores de Riesgo (HOPE vs SCS)

Apareamiento con cohorte histórica de cada Centro

Ciudad	UTH	Responsables
A CORUÑA	H. U. A Coruña	Irene Aguirrezabalaga
BADAJOZ	H. U. de Badajoz	Diego López
BARCELONA	H. U. de Bellvitge	Luis Secanella
BARCELONA	H. U. Vall d'Hebrón	Mireia Caralt
BILBAO	H. U. de Cruces	Beatriz Vellido
MADRID	H. U. Puerta de Hierro Majadahonda	Alberto Pueyo
SEVILLA	H. U. Virgen del Rocío	Luis Miguel Marín
VALLADOLID	H. U. Río Hortega	F. Javier Tejero

Review Article

Post-Reperfusion Syndrome in Liver Transplantation—An Overview

Michael W. Manning, MD, PhD[*], Priya A. Kumar, MD[†], Kamal Maheshwari, MD[‡], Harendra Arora, MD[†,1]

Risk Factors for Post-Reperfusion Syndrome

Donor/Organ-Related	Recipient-Related	Procedure-Related
Advanced age	MELD score	Prolonged WIT
Macrovesicular steatosis	Advanced age	Classic technique
Organ size mismatch	Elevated creatinine	Use of venovenous bypass
DCD donors	Elevated potassium	
Prolonged CIT	Low calcium	
	Decreased DBP	
	Absence of portocaval shunt	
	Poor vasoconstrictor response	
	Fulminant hepatitis	

Abbreviations: CIT, cold ischemia time; DBP, diastolic blood pressure; DCD, donation after cardiac death; MELD, model for end-stage liver disease; WIT, warm ischemia time.

APAREAMIENTO

HOPE 1 : 2 SCS

→ Edad donante	± 5 años
→ Edad receptor	± 5 años
→ Tiempo de preservación	± 60 minutos
→ Tipo de donación	DBD / DCD
→ MELD clínico	± 2 puntos
→ Fecha del trasplante	± 2 años

M.W. Manning et al. / Journal of Cardiothoracic and Vascular Anesthesia 34 (2020) 501–511

Multicéntrico HOPE España. Material y Método.

DEFINICIONES

- **Injerto HOPE:** Injerto mantenido en oxigenación hipotérmica > 60 min

- **Tiempo de preservación:** Tiempo comprendido desde perfusión fría órgano → reperfusión en receptor

  → Injertos SCS = Tiempo Isquemia Fría (CIT)
  → Injertos HOPE = Tiempo Isquemia Fría (CIT) + Tiempo en HOPE (tHOPE)

- **Síndrome de Reperfusión (RPS):**
  - 30% de la PAM o la FC primeros 5 minutos después de la reperfusión
  - Duración mínima de 1 minuto

  Aggarwal et al., 1993; Hilmi et al., 2008

- **Disfunción Primaria Injerto (EAD):**
  - Bilirrubina en sangre ≥10 mg/dL día 7 post-trasplante
  - INR ≥ 1.6 día 7 post-trasplante
  - Niveles de transaminasas > 2000 UI/L primeros 7 días post-trasplante

  Olthoff et al., 2010

- **Colangiopatía Isquémica:**
  - ColangioRM compatible
  - No relacionada con patologia arterial

Multicéntrico HOPE España. Material y Método.

VARIABLES PRINCIPALES

- Tipo preservación: SCS / HOPE
- Síndrome de Reperfusióin:
  - ✓ PA previa desclampaje VSH/VP (PA menor 5’ post-desclampaje VSH/VP)
  - ✓ Temperatura fase anhepática (Ta menor durante la fase de reperfusión)
  - ✓ DVA durante f.anhepática y durante f.reperfusión (tipo y dosis)
  - ✓ Niveles de potasio en fase anhepática y durante la reperfusión (mEq/L)

VARIABLES SECUNDARIAS

- Número (porcentaje) de pacientes que presentan disfunción precoz del injerto
- Número (porcentaje) de pacientes que presentan complicaciones postoperatorias graves (Clavien > IIIA)
- Número (porcentaje) de pacientes que presentan lesiones biliares no anastomóticas (colangiopatía isquémica)

Multicéntrico HOPE España. Material y Método: Análisis estadístico

Análisis descriptivo	Medidas de Asociación	Análisis Factores de Riesgo
➢ Mediana (*IQR*), n (frecuencias)	➢ χ^2 (F), t-Student (U Mann-Whitney)	➢ Regresión Logística

Cohortes Apareadas

- Medidas de Asociación
- Regresión logística ajustada

Intervalos de confianza al 95%

Variable dependiente (principal): Aparición Sd Reperfusión

Multicéntrico HOPE España. Material y Método: Análisis estadístico

Análisis descriptivo	Medidas de Asociación	Análisis Factores de Riesgo
➢ Mediana (*IQR*), n (frecuencias)	➢ χ^2 (F), t-Student (U Mann-Whitney)	➢ Regresión Logística

~~Cohortes Apareadas~~

- ~~Medidas de Asociación~~
- ~~Regresión logística ajustada~~

¡ 43 SCSs !

Intervalos de confianza al 95%

Variable dependiente (principal): Aparición Sd Reperfusión

Multicéntrico HOPE España. Resultados: Donantes

DONANTES	TOTAL 254p	SCS 155p (61%)	HOPE 99p (%)	*P*
Age (y), *median (IQR)*	67 (54 – 73)	66 (54 – 72)	69 (54 – 77)	**0.014**
Age > 70y, *n(%)*	96 (37.8%)	50 (32.3%)	46 (46.5%)	**0.023**
Sex female, *n(%)*	121 (47.6%)	74 (47.7%)	47 (47.5%)	0.967
Donor group, *n(%)*				0.918
0	123 (48.4%)	76 (49.0%)	47 (47.5%)	
A	107 (42.1%	63 (40.7%)	44 (44.4%)	
B	16 (6.3%)	11 (7.1%)	5 (5.1%)	
AB	8 (3.2%)	5 (3.2%)	3 (3.0%)	
BMI (kg/m2), *median (IQR)*	26.1 (23.9 – 28.9)	26.0 (23.5 – 28.7)	26.1 (24.1 – 29.3)	0.430
BMI > 30 kg/m2, *n(%)*	43 (16.9%)	23 (14.8%)	20 (20.2%)	0.266
Cardiac arrest, *n(%)*	69 (27.2%)	38 (24.5%)	31 (31.3%)	0.235
ICU stay (days), *median (IQR)*	3 (2 – 6)	3 (2 – 6)	3 (2 – 6)	0.456
ICU stay > 5 days, n(%)	76 (29.9%)	49 (31.6%)	27 (27.3%)	0.461
Previous cardiopathy, *n(%)*	44 (17.3%)	30 (19.4%)	14 (14.1%)	0.012
History of Diabetis, *n(%)*	**37 (14.6)**	**18 (11.6%)**	**19 (19.2%)**	**0.023**
Vasoactive Drugs (NA), *n(%)*	130 (53.9%)	82 (57.3%)	48 (49.0%)	0.201
Blood Test, median (IQR)				
Creatinin (mmol/L)	60.2 (44.4 – 80)	58.5 (45.2 – 80)	61 (40 – 84)	0.982
ALT (IU/L)	25 (17 – 48)	26 (18 – 46)	23.5 (15 – 57)	0.780
AST (IU/L)	30 (20 – 52)	29 (20 – 48)	31.5 (21 – 66)	0.386
GGT (IU/L)	39.5 (24 – 99)	48 (24 – 102)	38 (22 – 95)	0.443
Bilirubin ()	8.6 (5.1 – 12.0)	8.0 (5.1 – 11)	9 (5.3 – 13.4)	0.287
DCD, n(%)	131 (51.6%)	81 (52.3%)	50 (50.5%)	0.785
fWIT (min), *median (IQR)*	15 (11 – 20)	14 (10 – 18)	16 (12 – 21)	0.114
fWIT > 20 min, *n(%)*	27 (20.6%)	14 (17.3%)	13 (26.0%)	0.231
NRP time (min), *median (IQR)*	100.5 (70 – 125)	99 (69 – 128)	105 (70 – 122)	0.930
NRP time > 120 min, n(%)	38 (29.0%)	25 (30.9%)	13 (26.0%)	0.551
Esteatosis (surgeon)	**100 (39.4%)**	**58 (37.4%)**	**42 (42.4%)**	**<0.001**
< 30%	**96 (37.8%)**	**57 (36.8%)**	**39 (39.4%)**	
30 %– 60%	**4 (1.6%)**	**1 (0.7%)**	**3 (3.0%)**	

Multicéntrico HOPE España. Resultados: Receptores

RECEPTORES	TOTAL 254p	SCS 155p (61%)	HOPE 99p (%)	*P*
Age (y), *median (IQR)*	60 (54 – 65)	59 (54 – 65)	61 (54 – 65)	0.657
Age > 65y, *n(%)*	58 (22.8%)	37 (23.9%)	21 (21.2%)	0.622
Sex female, *n(%)*	65 (25.6%)	42 (27.1%)	23 (23.2%)	0.561
Group, n(%)				0.006
0	105 (41.3%)	65 (41.9%)	40 (40.4%)	
A	109 (42.9%)	70 (45.2%)	39 (39.4%)	
B	18 (7.1%)	13 (8.4%)	5 (5.1%)	
AB	11 (4.3%)	6 (3.9%)	5 (5.1%)	
BMI (kg/m2), *median (IQR)*	27.1 (24.2 – 30.1)	27.5 (24.9 – 30.7)	26.7 (24 – 29.1)	0.100
BMI > 30 kg/m2, *n(%)*	66 (26.0%)	45 (29.0%)	21 (21.2%)	0.166
Main Indication, *n(%)*				0.455
ALCI / MAFLD	97 (38.2%)	58 (37.4%)	39 (39.4%)	
HCC	77 (30.3%)	46 (29.7%)	31 (31.3%)	
Virus	24 (9.5%)	18 (11.6%)	6 (6.1%)	
Cholestatic Disease	18 (7.1%)	10 (6.5%)	8 (8.1%)	
Retransplantation	10 (3.9%)	5 (3.2%)	5 (5.1%)	
Tumoral (Klatskin, CRLM)	9 (3.5%)	5 (3.2%)	4 (4.0%)	
Acute Liver Failure	9 (3.5%)	5 (3.2%)	4 (4.0%)	
Autoinmune	6 (2.4%)	6 (3.9%)	0	
Cystic Disease	3 (1.2%)	1 (0.7%)	2 (2.0%)	
Budd-Chiari	1 (0.4%)	1 (0.7%)	0	
MELD (clinical), *median (IQR)*	17 (12 – 20)	17.5 (12 – 20)	17 (12 – 20.5)	0.868
Medical History, *n(%)*				
Diabetis	82 (32.3%)	48 (31.0%)	34 (34.3%)	0.575
HTA	86 (33.9%)	54 (34.8%)	32 (32.3%)	0.679
Hepatorenal Syndrome	16 (6.3%)	10 (6.5%)	6 (6.1%)	0.900
Dyalisis	13 (5.1%)	9 (5.8%)	4 (4.0%)	0.533
Major Abdominal Surgery	64 (25.2%)	40 (25.8%)	24 (24.2%)	0.779
Admision				0.072
Elective	220 (86.6%)	140 (90.3%)	80 (80.8%)	
In-hospital stay	25 (9.8%)	12 (7.7%)	13 (13.1%)	
ICU stay	9 (3.5%)	3 (1.9%)	6 (6.1%)	

Multicéntrico HOPE España. Resultados: Receptores

CIRUGÍA	TOTAL 254p	SCS 155p (61%)	HOPE 99p (%)	*P*
Perfusion Solution, *n(%)*				0.035
IGL-1	92 (36.2%)	63 (40.7%)	29 (29.3%)	
Custodiol	79 (31.1%)	39 (25.2%)	40 (40.4%)	
Celsior	72 (28.4%)	48 (31.0%)	24 (24.2%)	
Belzer	7 (2.8%)	4 (2.6%)	3 (3.0%)	
Preservation time (min), *median (IQR)*	352 (300 – 415)	347 (290 – 404)	360 (305 – 420)	0.224
Preserv.time > 480m, *n(%)*	33 (13.0%)	18 (11.6%)	15 (15.2%)	0.413
HOPE time (min), *median (IQR)*			122 (102 – 150)	
HOPE > 120 min, *n(%)*			53 (53.5%)	
Operative time (min), *median (IQR)*	300 (240 – 390)	302.5 (240 – 400)	290 (230 – 370)	0.242
RBC (units), *median (IQR)*	3 (0 – 6)	3 (1 – 6)	3 (0 – 6)	0.712
FP (units), *median (IQR)*	0 (0 – 4)	0 (0 – 5)	0 (0 – 4)	0.177
Platelets (units), *median (IQR)*	0 (0 – 2)	0 (0 – 2)	0 (0 – 1)	0.119
Fibrinogen (grams), *median (IQR)*	0 (0 – 4)	0 (0 – 4)	0 (0 – 2)	0.072
Piggy-back, *n(%)*	225 (88.6%)	136 (87.7%)	89 (89.9%)	0.598
Arterial Anastomosis				
Type, *n(%)*				0.631
To the Hepatic A.	239 (94.1%)	144 (92.9%)	95 (96.0%)	
To the Splenic A.	11 (4.3%)	7 (4.5%)	4 (4.0%)	
To the Aorta	3 (1.2%)	3 (1.9%)	0	
Final Flow (mL/min), *median (IQR)*	**200 (130 – 290)**	**180 (120 – 256)**	**237.5 (143.5 – 305)**	**0.006**
Arterial Ischemia Time, *median*	36.5 (29 – 50)	35 (30 – 51)	37 (26 – 45)	0.302
Portal Anastomosis				
Type, *n(%)*				0.703
TT	240 (94.5%)	144 (92.9%)	96 (97.0%)	
TT + Thrombectomy	9 (3.5%)	6 (3.9%)	3 (3.0%)	
Mesoportal	1 (0.4%)	1 (0.7%)	0	
Renoportal	3 (1.2%)	3 (1.9%)	0	
Final Flow (mL/min), *median (IQR)*	1400 (1050 – 1800)	1400 (1009 – 1800)	1300 (1053 – 1800)	0.810
Biliary Anastomosis				
Type, n(%)				0.269
TT	208 (81.9%)	122 (78.7%)	86 (86.9%)	
TT + kehr	29 (11.4%)	22 (14.2%)	7 (7.1%)	
Biliary derivation	16 (6.3%)	10 (6.5%)	6 (6.1%)	

Multicéntrico HOPE España. Resultados: Receptores

RESULTADOS	TOTAL 254p	SCS 155p (61%)	HOPE 99p (%)	*P*
Reperfusion Sd, *n(%)*	106 (41.7%)	70 (66.0%)	36 (34.0%)	0.166
Weaning (min), *median (IQR)*	720 (420 – 1440)	800 (540 – 1560)	480 (360 – 840)	0.003
ICU stay (d), *median (IQR)*	4 (2 – 6)	4 (2 – 6)	4 (2 – 6)	0.714
EAD (Database), *n(%)*	44 (17.3%)	28 (18.1%)	16 (16.2%)	0.696
EAD (Olthoff), *n(%)*	56 (22.1%)	34 (21.9%)	22 (22.2%)	0.957
ALT peak 1st week, *median (IQR)*	518.5 (274 – 1000)	555 (298 – 1005)	463 (239 – 998)	0.295
AST peak 1st week, *median (IQR)*	556 (288 – 1102)	553 (288 – 1102)	569 (272 – 1255)	0.925
BB peak 1st week, *median (IQR)*	46 (28.6 – 100.9)	46.2 (29.1 – 107.7)	41.9 (27.7 – 98.3)	0.660
Creat peak 1st week, *median (IQR)*	117 (81 – 166)	115.5 (82 – 163.5)	118.8 (80 – 167.4)	0.928
Renal failure, *n(%)*	78 (30.7%)	44 (28.4%)	34 (34.3%)	0.316
PNF, *n(%)*	7 (2.8%)	6 (3.9%)	1 (1.0%)	0.169
Retransplantation, *n(%)*	13 (5.1%)	7 (4.5%)	6 (6.1%)	0.586
Emergency, n(%)	6 (2.4%)	3 (1.9%)	3 (3.0%)	0.681
Arterial Complications, *n(%)*	26 (10.2%)	17 (11.0%)	(9.1%)	0.630
Acute (<7d), *n(%)*	15 (5.9%)	9 (5.8%)	6 (6.1%)	0.933
Types				0.806
Thrombosis	18 (7.1%)	12 (7.7%)	6 (6.1%)	
Stenosis	4 (1.6%)	3 (1.9%)	1 (1.0%)	
Others	4 (1.6%)	2 (1.3%)	2 (2.0%)	
Biliary Complications, *n (%)*	67 (26.4%)	40 (25.8%)	27 (27.3%)	0.796
Postoperative, *n(%)*				
Types, n(%)				0.415
Leak	31 (12.2%)	22 (14.2%)	9 (9.1%)	
Stenosis	31 (12.2%)	15 (9.7%)	16 (16.2%)	
Ischemic Cholangiopathy	2 (0.8%)	1 (0.7%)	1 (1.0%)	
Others	3(1.2%)	2 (1.3%)	1 (1.0%)	
Morbidity Clavien > IIIA, n(%)	71 (28.0%)	43 (27.7%)	28 (28.3%)	0.925
90-days Mortality, n(%)	34 (13.4%)	26 (16.8%)	8 (8.1%)	0.047
Hospital stay (d), median (IQR)	14 (10 – 22)	14 (9 – 24)	15 (10 – 21)	0.855
Acute Rejection, *n(%)*	16 (6.3%)	9 (5.8%)	7 (7.1%)	0.686

Multicéntrico HOPE España. Resultados: Receptores

RESULTADOS	TOTAL 254p	SCS 155p (61%)	HOPE 99p (%)	*P*
Reperfusion Sd, *n(%)*	106 (41.7%)	70 (66.0%)	36 (34.0%)	0.166
Weaning (min), *median (IQR)*	**720 (420 – 1440)**	**800 (540 – 1560)**	**480 (360 – 840)**	**0.003**
ICU stay (d), *median (IQR)*	4 (2 – 6)	4 (2 – 6)	4 (2 – 6)	0.714
EAD (Database), *n(%)*	44 (17.3%)	28 (18.1%)	16 (16.2%)	0.696
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Creat peak 1st week, *median (IQR)*	117 (81 – 166)	115.5 (82 – 163.5)	118.8 (80 – 167.4)	0.928
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Stenosis	31 (12.2%)	15 (9.7%)	16 (16.2%)	
Ischemic Cholangiopathy	2 (0.8%)	1 (0.7%)	1 (1.0%)	
Others	3(1.2%)	2 (1.3%)	1 (1.0%)	
Morbidity Clavien > IIIA, n(%)	71 (28.0%)	43 (27.7%)	28 (28.3%)	0.925
90-days Mortality, n(%)	**34 (13.4%)**	**26 (16.8%)**	**8 (8.1%)**	**0.047**
Hospital stay (d), median (IQR)	14 (10 – 22)	14 (9 – 24)	15 (10 – 21)	0.855
Acute Rejection, *n(%)*	16 (6.3%)	9 (5.8%)	7 (7.1%)	0.686

Multicéntrico HOPE España. Resultados: Factores de Riesgo

Risk Factors for Reperfusion Syndrome

	UNIVARIATE		MULTIVARIATE	
	OR (95%CI)	*p*	OR (95%CI)	*p*
Use of HOPE	0.69 (0.41 – 1.16)	0.166	0.66 (0.37 – 1.16)	0.148
DCD (vs DBD)	**1.72 (1.04 – 2.86)**	**0.035**	1.66 (0.90 – 3.03)	0.103
Donor age > 70y	0.75 (0.45 – 1.27)	0.287		
Donor sex female	1.09 (0.66 – 1.79)	0.739		
Donor BMI > 30 kg/m2	1.13 (0.58 – 2.19)	0.720		
Donor cardiac arrest	1.10 (0.63 – 1.93)	0.730		
Donor ICU stay > 5d	**1.89 (1.10 – 3.25)**	**0.022**	1.51 (0.79 – 2.90)	0.212
Significant Graft Steathosis (surgeon)	0.68 (0.40 – 1.13)	0.133	0.94 (0.53 – 1.66)	0.827
Patient age > 65y	**2.03 (1.12 – 3.67)**	**0.019**	**2.18 (1.14 – 4.17)**	**0.018**
Patient sex female	0.98 (0.55 – 1.74)	0.946		
Patient BMI > 30 kg/m2	1.45 (0.82 – 2.55)	0.197		
Patient MELD > 25p	**2.64 (1.15 – 6.02)**	**0.021**	1.72 (0.63 – 4.71)	0.293
Patient with Hepatorenal Sd	1.09 (0.39 – 3.03)	0.866		
Patient status at LT				
In-hospital	**2.71 (1.14 – 6.42)**	**0.023**	2.11 (0.70 – 6.38)	0.187
ICU	0.76 (0.18 – 3.14)	0.709	0.66 (0.14 – 3.14)	0.597
Preservation time > 480min	**3.26 (1.51 – 7.07)**	**0.003**	**3.34 (1.44 – 7.76)**	**0.005**
Operative time > 360min	1.69 (0.99 – 2.90)	0.054	1.27 (0.69 – 2.33)	0.447
Transfusion > 4 RBCs	**1.92 (1.13 – 3.26)**	**0.016**	1.54 (0.82 – 2.89)	0.178
Fibrinogen > 4 grams	1.06 (0.61 – 1.82)	0.845		

Multicéntrico HOPE España. Resultados: Grupos

SCS
74p (61.0%)

	DBD			DCD		
	Age < 65y 57p (77.0%)	**Age > 65y** 17 (23.0%)	**p**	**Age < 65y** 61p (75.3%)	**Age > 65y** 20p (24.7%)	**p**
Reperfusion Sd	19p (33.3%)	9 (52.9%)	0.153	28p (45.9%)	14 (70.0%)	0.061

HOPE
99p (39.0%)

	DBD			DCD		
	Age < 65y 37p (75.5%)	**Age > 65y** 12 (24.5%)	**p**	**Age < 65y** 41p (82.0%)	**Age > 65y** 9p (18.0%)	**p**
Reperfusion Sd	12 (32.4%)	3 (25.0%)	0.627	15p (36.6%)	6 (66.7%)	0.098

Multicéntrico HOPE España. Resultados: Grupos

SCS
74p (61.0%)

	DBD			DCD		
	PT<480 63p (85.1%)	**PT>480** 11 (14.9%)	**p**	**PT < 8h** 74p (91.4%)	**PT > 8h** 7p (8.6%)	**p**
Reperfusion Sd	20p (31.8%)	8 (72.7%)	0.010	37p (50.0%)	5p (71.4%)	0.278

HOPE
99p (39.0%)

	DBD			DCD		
	Age < 65y 40p (81.6%)	**PT > 8h** 9 (18.4%)	**p**	**PT < 8h** 44p (88.0%)	**PT > 8h** 6p (12.0%)	**p**
Reperfusion Sd	10p (25.0%)	5 (55.6%)	0.627	17p (38.6%)	4p (66.7%)	0.192

Multicéntrico HOPE España. Resultados: Factores de Riesgo

EAD

	MULTIVARIATE OR (95%CI)	*p*
Use of HOPE	0.92 (0.42 – 2.01)	0.843
DCD (vs DBD)	0.67 (0.30 – 1.48)	0.318
Donor age > 70y		
Donor sex female	0.49 (0.22 - 1.08)	0.078
Donor BMI > 30 kg/m2		
Donor cardiac arrest	2.21 (0.93 – 5.23)	0.071
Donor ICU stay > 5d		
Significant Graft Steathosis (surgeon)	2.51 (1.16 – 5.44)	0.020
Patient age > 65y	0.44 (0.16 – 1.20)	0.110
Patient sex female		
Patient BMI > 30 kg/m2	2.93 (1.35 – 6.36)	0.007
Patient MELD > 25p	3.23 (0.79 – 13.13)	0.101
Patient with Hepatorenal Sd		
Patient status at LT		
In-hospital	0.32 (0.06 – 1.55)	0.156
ICU	3.07 (0.44 – 21.20)	0.255
Preservation time > 480min		
Operative time > 360min	4.52 (2.03 – 10.06)	<0.001
Transfusion > 4 RBCs		
Fibrinogen > 4 grams	1.34 (0.58 – 3.09)	0.490

90-day MRT

	MULTIVARIATE OR (95%CI)	*p*
Use of HOPE	0.43 (0.18 – 1.03)	0.050
DCD (vs DBD)	0.70 (0.30 – 1.61)	0.405
Donor age > 70y		
Donor sex female		
Donor BMI > 30 kg/m2		
Donor cardiac arrest		
Donor ICU stay > 5d	0.45 (0.16 – 1.28)	0.133
Significant Graft Steathosis (surgeon)		
Patient age > 65y	2.06 (0.88 – 4.81)	0.095
Patient sex female		
Patient BMI > 30 kg/m2	1.79 (0.79 – 4.05)	0.164
Patient MELD > 25p	1.32 (0.38 – 4.52)	0.662
Patient with Hepatorenal Sd	2.01 (0.52 – 7.79)	0.315
Patient status at LT		
In-hospital		
ICU		
Preservation time > 480min		
Operative time > 360min		
Transfusion > 4 RBCs		
Fibrinogen > 4 grams	2.30 (0.99 – 5.36)	0.053

Multicéntrico HOPE España. Límites.

- Estudio retrospectivo con grupo control “histórico”
- Imposibilidad de realizar análisis emparejado (faltan controles)
- Heterogeneidad en el método: tiempos preHOPE dispares, diferentes temperaturas, variabilidad de flujos…
- Experiencia “inicial”

- Existe suficiente evidencia para justificar el uso de HOPE, fundamentalmente con la mejora de las tasas de disfunción primaria y colangiopatía isquémica

- En un entorno privilegiado (España) se requieren más estudios que determinen en qué escenarios concretos el HOPE aporta claros beneficios.

- La imposibilidad de explorar la viabilidad del injerto durante HOPE limita su uso a evitar un excesivo “deterioro” del hígado subóptimo durante la preservación: donantes / injertos marginales, tiempos de preservación prolongados.

- A pesar de la incorporación de nuevas tecnologías, el tiempo de preservación prolongado sigue siendo el principal factor de riesgo para el síndrome de reperfusión.

- A pesar de no estar entre los objetivos del estudio, el uso de HOPE se ha relacionado con una menor mortalidad a 90 días post-trasplante.