Hospices Civils de Lyon

Chirurgie Cardiovasculaire de l'Adulte

Université de Lyon

Lyon 1

LES MACHINES À PERFUSION POUR LE GREFFON CARDIAQUE: RÉELLE ÉVOLUTION OU BELLE COMMUNICATION

Dr. Matteo POZZI

Praticien Hospitalier

Service de Chirurgie Cardiaque A

Pr. Jean François OBADIA

Hôpital « Louis Pradel » - Lyon

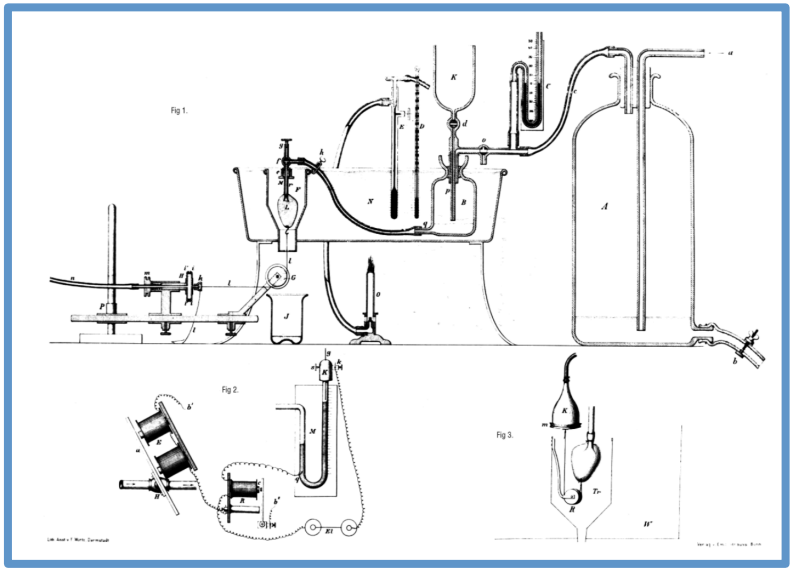
GICC

LIENS D'INTERETS

Aucun conflit d'intérêt en rapport avec cette présentation

RAPPEL HISTORIQUE

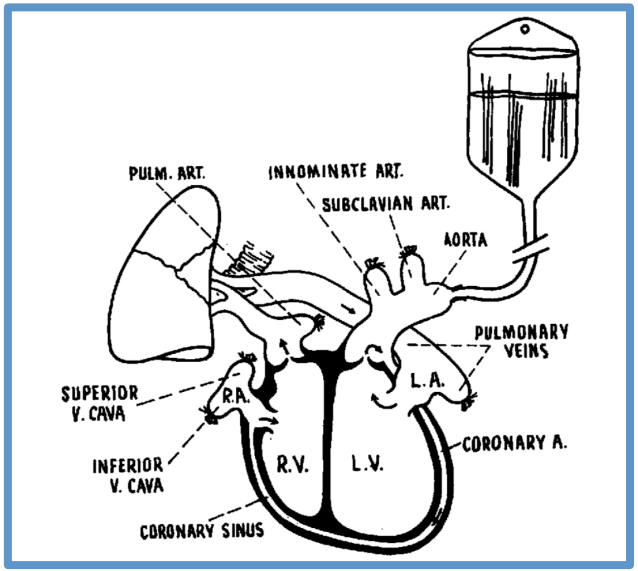
1895



Modèle de Langendorff

News Physiol Sci 1998;13:203-210

1959



Modèle de Robicsek

Am J Cardiol 1967;20:803-811

The Organ Care System (OCS™)

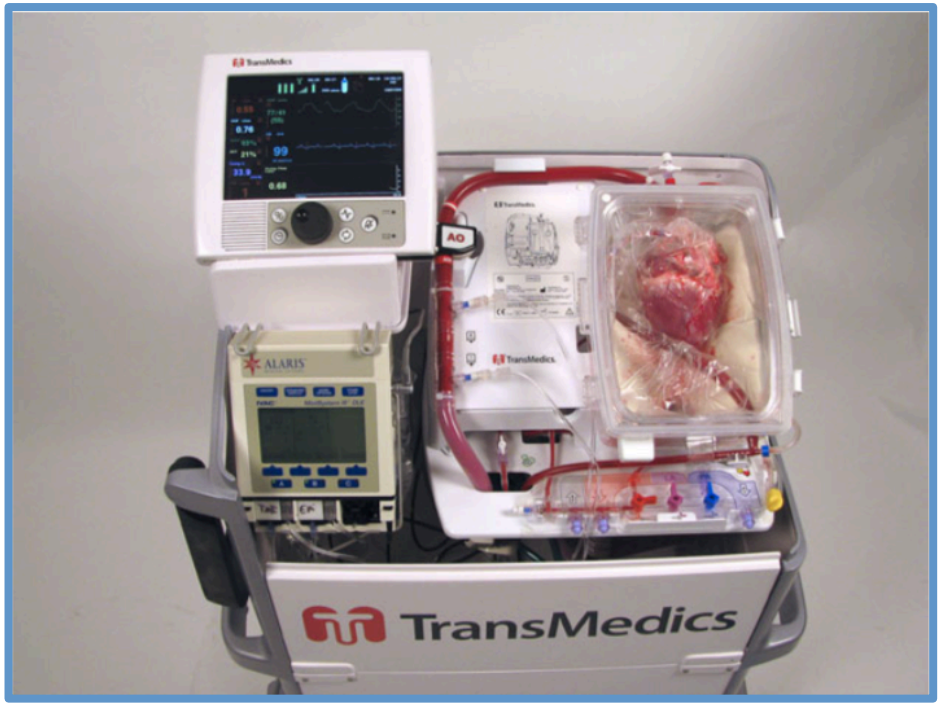
TransMedics®

Monitor

Console

Module de Perfusion

ORGAN CARE SYSTEM



- machine portable

- perfusion en continu
(pompe à flux pulsatile)

- oxygénateur

- normothermie
(échangeur thermique)

Transpl Int 2015;28:634-642

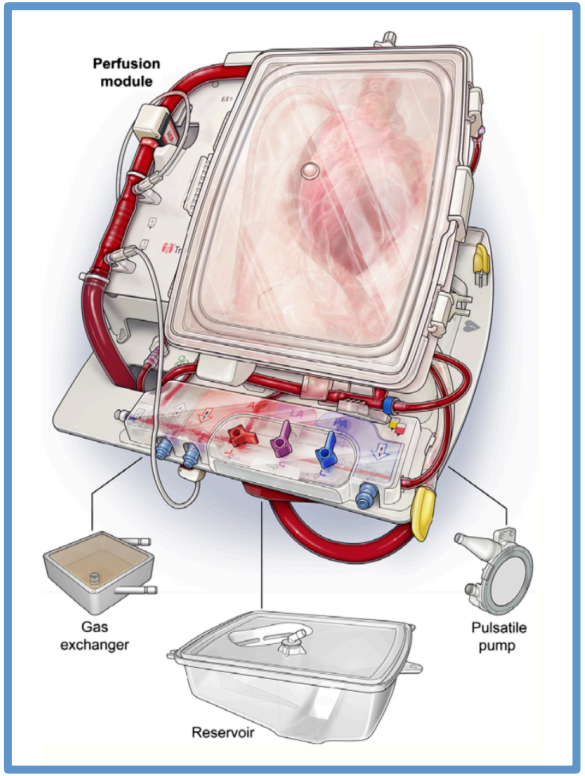
ORGAN CARE SYSTEM

Liquide de perfusion

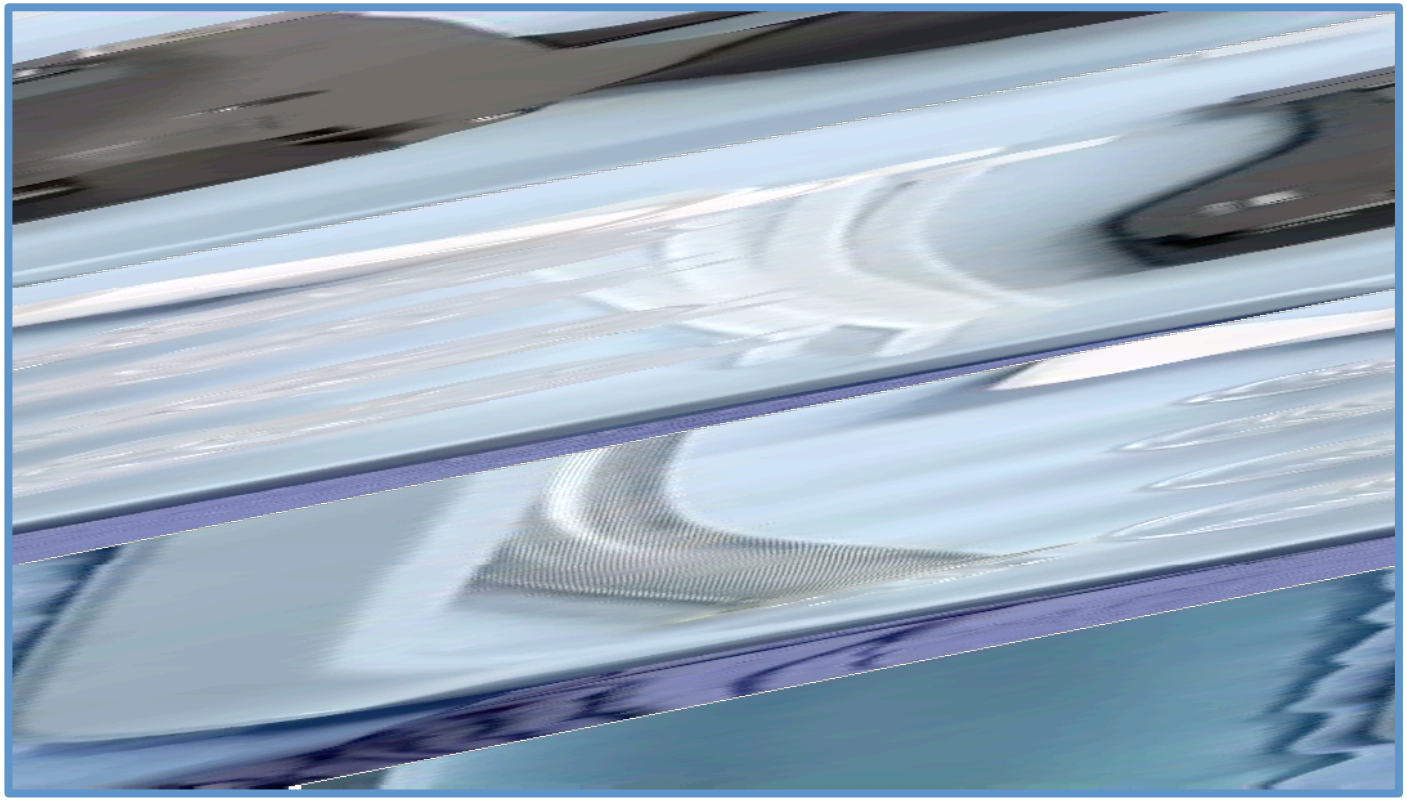
Sang du donneur (1.2-1.5 L)

Solution de perfusion

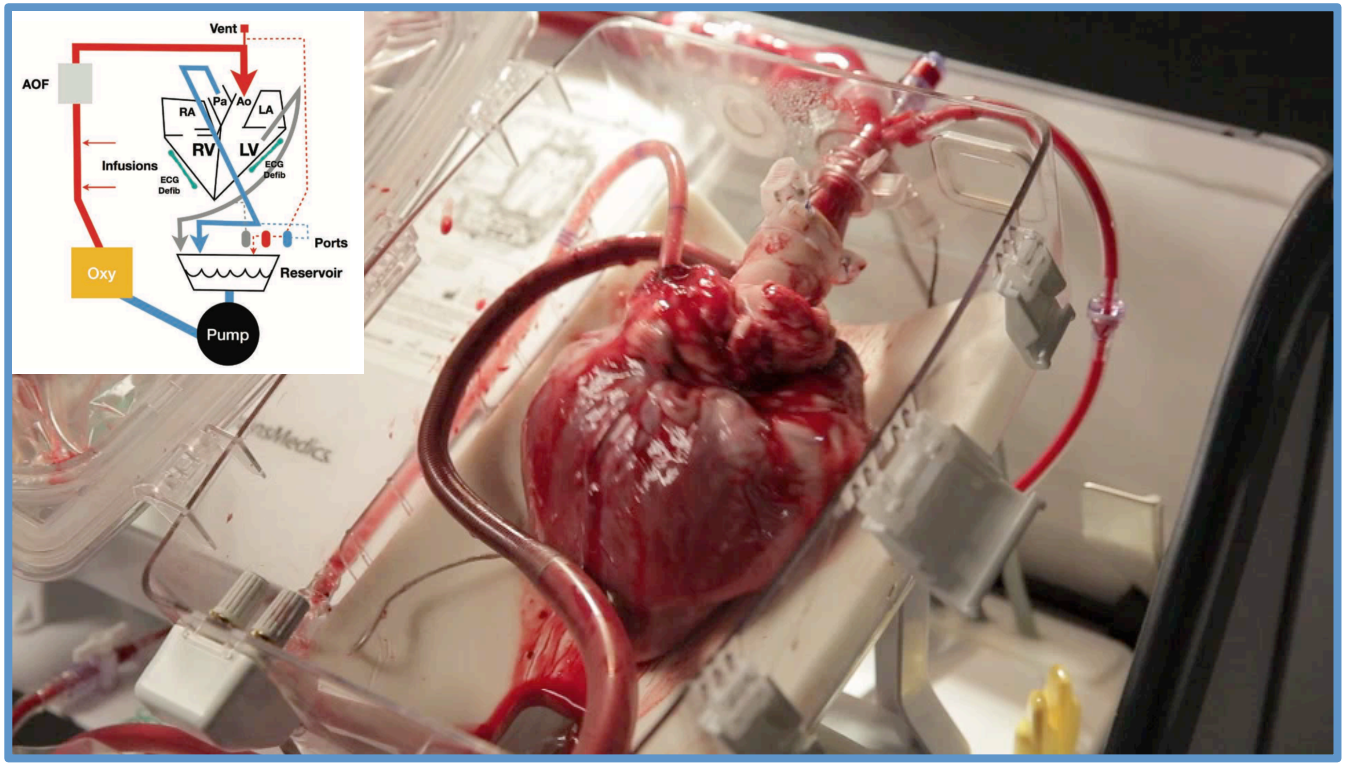
Transpl Int 2015;28:634-642



ORGAN CARE SYSTEM



ORGAN CARE SYSTEM



ORGAN CARE SYSTEM

EVALUATION FONCTIONNELLE

ECG - Hct - SaO_2

Température

Débit / Pression aortique

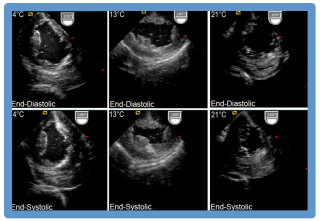
Débit coronarien

Lactate <5 mmol/L

FACTEUR PREDICTIF

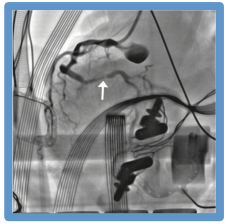
APPLICATIONS POSSIBLES

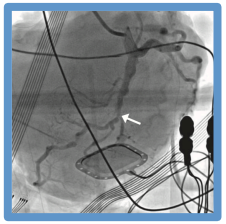
Echographie épicardique



Am J Transplant 2014;14:2253-2262

Coronarographie





Circulation 2014; 130:e341-e343

AUTRES MACHINES A PERFUSION

Steen Preservation Heart System

Scand Cardiovasc J 2016;50:193-200

HeartPort System

Transpl Int 2015;28:224-231

LifeCradle Heart Perfusion System

J Thorac Cardiovasc Surg 2014;148:2310-2315

Paragonix Sherpa Perfusion™ Cardiac Transport System

Ann Transplant 2015; 20:461-468

APPLICATIONS CLINIQUES

PERFUSION EX-VIVO

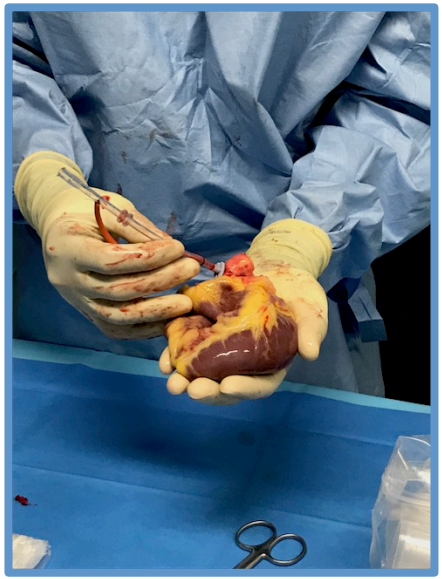
DONATION AFTER CIRCULATORY DEATH (MAASTRICHT III)

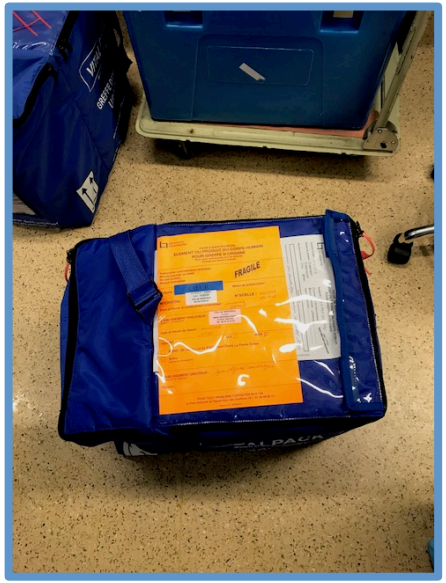
APPLICATIONS CLINIQUES

PERFUSION EX-VIVO

PERFUSION EX-VIVO

Conservation hypothermique (4°C)

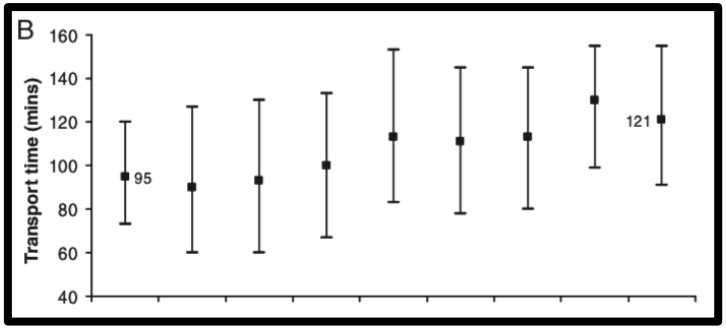




PERFUSION EX-VIVO

Conservation hypothermique (4°C)

↑ TEMPS ISCHEMIE FROIDE

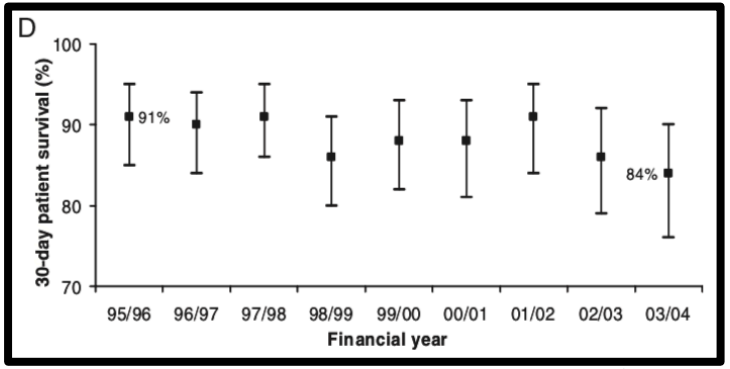


Parameter	Odds ratio	95% Confidence interval for odds ratio	*P*
Transport time (per 15-min increment)	1.06	1.01–1.12	0.0283
Surgical implant time (per 15-min increment)	1.11	1.04–1.18	0.0012

The Importance of Cold and Warm Cardiac Ischemia for Survival After Heart Transplantation

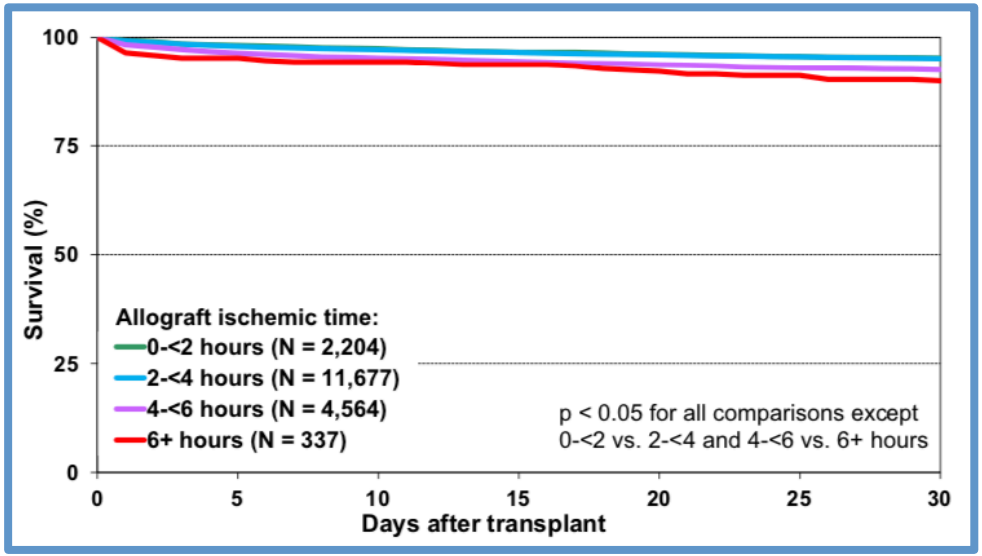
Transplantation 2008;86:542-547

↑ MORTALITE à 30J



PERFUSION EX-VIVO

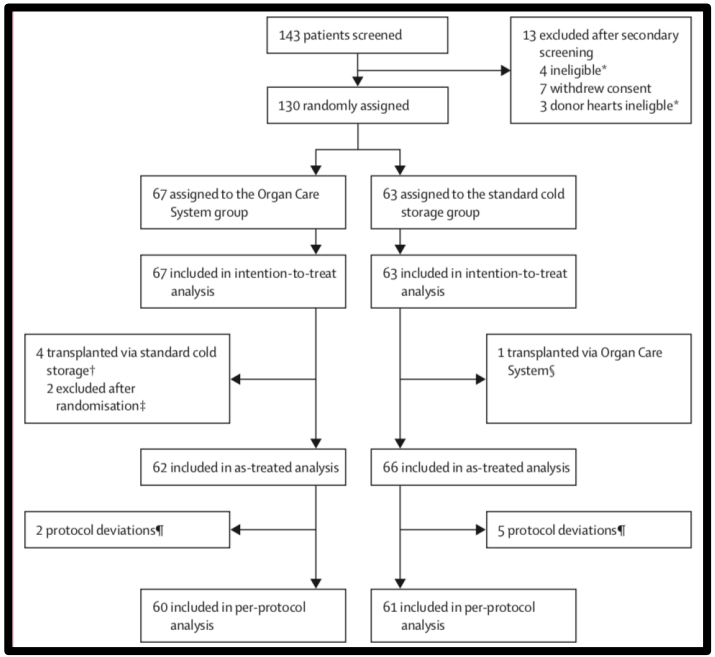
The Registry of the International Society for Heart and Lung Transplantation: Thirty-fourth Adult Heart Transplantation Report—2017; Focus Theme: Allograft ischemic time



J Heart Lung Transplant 2017;36:1037-1046

PERFUSION EX-VIVO

PROCEED II Trial



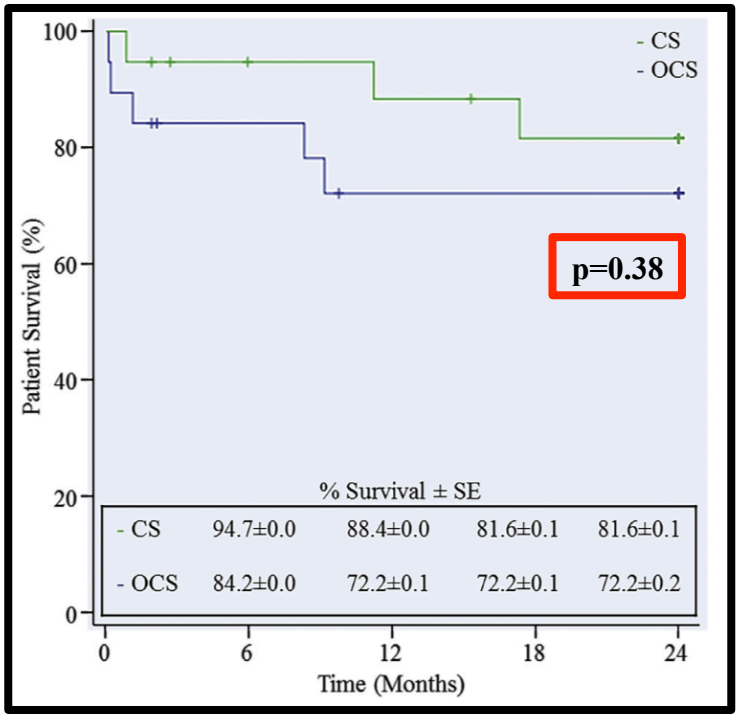
	Organ Care System group	Standard cold storage group	Between-group difference (one-sided 95% UCB or 95% CI)	p value
Primary endpoint (30 day patient and graft survival)				
Intention-to-treat	63/67 (94%)	61/63 (97%)	2·8 (8·8)	0·45
As-treated	58/62 (94%)	64/66 (97%)	3·5 (9·6)	0·36
Per-protocol	56/60 (93%)	59/61 (97%)	3·4 (9·9)	0·39
Secondary endpoints (as-treated population)				
Patients with cardiac-related serious adverse events	8 (13%)	9 (14%)	1 (−12 to 11)	0·90
Incidence of severe rejection	11 (18%)	9 (14%)	4 (−8 to 17)	0·52
Median ICU length of stay (h)	147 (107–212)	137 (97–197)	10 (−10 to 42)	0·24

67 OCS vs. 63 standard

Lancet 2015;385:2577-2584

PERFUSION EX-VIVO

Intermediate outcomes with ex-vivo allograft perfusion for heart transplantation

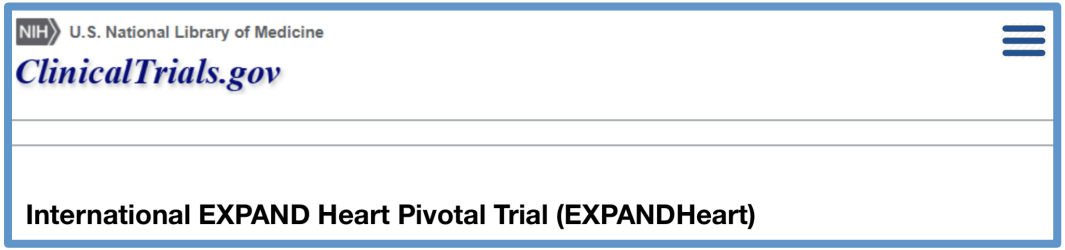


	Organ Care System (n = 19)	Cold storage (n = 19)	p-value
Survival	72.2%	81.6%	0.38
Freedom from NF-MACE	90.9%	94.7%	0.90
Freedom from CAV	100.0%	78.5%	0.09

	Organ Care System (n = 19)	Cold storage (n = 19)	p-value
Freedom from ATR	53.0%	61.8%	0.48
Freedom from ACR	72.5%	69.6%	0.93
Freedom from AMR	94.7%	100.0%	0.30
Freedom from BNR	79.2%	85.6%	0.48

J Heart Lung Transplant 2017;36:258-263

PERFUSION EX-VIVO



Brief Summary:

To evaluate the effectiveness of the OCS™ Heart to recruit, preserve and assess donor hearts that may not meet current standard donor heart acceptance criteria (as identified above) for transplantation to potentially improve donor heart utilization for transplantation

Primary Outcome Measures :

1. A composite endpoint of patient survival at Day-30 post transplant and absence of severe primary heart graft dysfunction in the first 24 hours post-transplantation [Time Frame: 30 Days]

APPLICATIONS CLINIQUES

DONATION AFTER CIRCULATORY DEATH (MAASTRICHT III)

DONATION AFTER CIRCULATORY DEATH

1967

THE OPERATION

A HUMAN CARDIAC TRANSPLANT: AN INTERIM REPORT OF A SUCCESSFUL OPERATION PERFORMED AT GROOTE SCHUUR HOSPITAL, CAPE TOWN

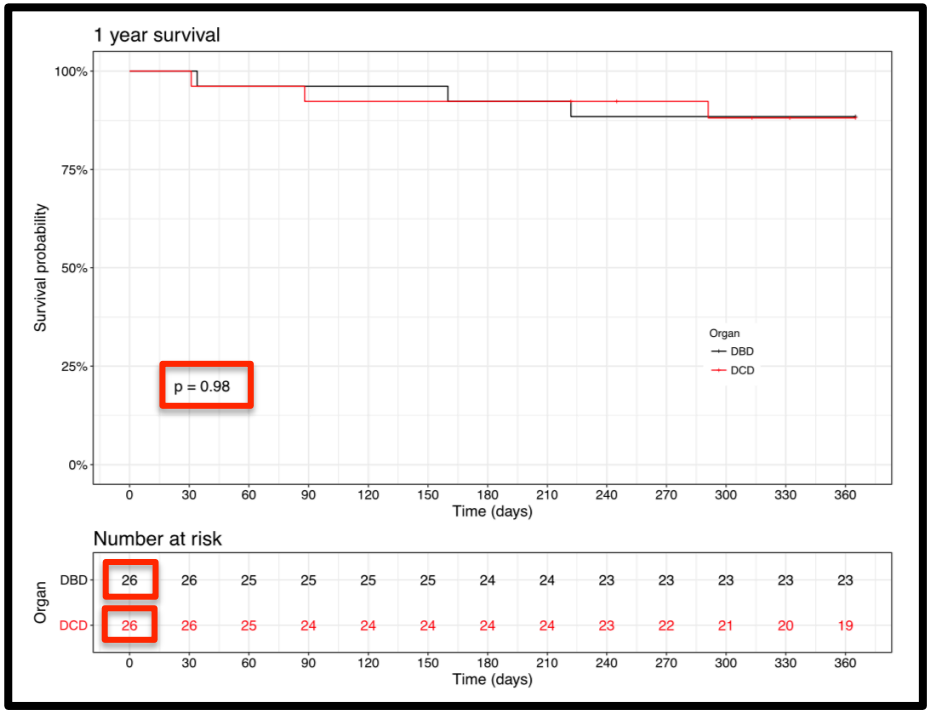
S Afr Med J 1967;41:1271-1274

2014

Adult heart transplantation with distant procurement and ex-vivo preservation of donor hearts after circulatory death: a case series

Lancet 2015;385:2585-2591

Outcome after heart transplantation from donation after circulatory-determined death donors

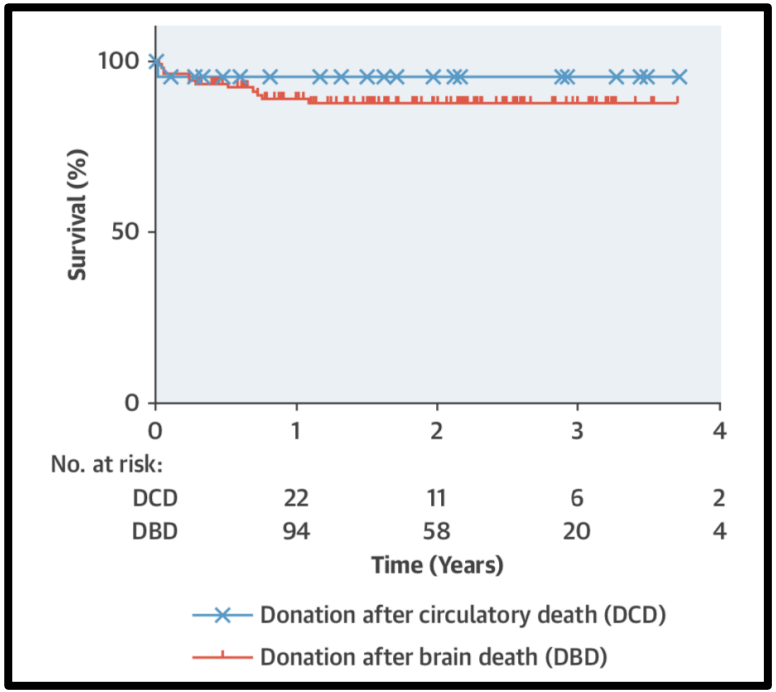


EXPERIENCE ANGLAISE

	DCD vs DBD		
	DCD ($n = 26$)	DBD ($n = 26$)	p-value[b]
Mechanical support			
IABP	7 (27)	4 (15)	0.51
ECMO	3 (12)	1 (4)	0.63
VAD	1 (4)	0 (0)	1.00

J Heart Lung Transplant 2017;36:1311-1318

Outcomes of Donation After Circulatory Death Heart Transplantation in Australia



EXPERIENCE AUSTRALIENNE

Cross clamp time, min		81 ± 33
Bypass time, min		181 ± 67
Mechanical support		9/23
ECMO	34.7%	8/23
IABP		2/23

J Am Coll Cardiol 2019;73:1447-1459

ACTIVITE DE TRANSPLANTATION

Outcome after heart transplantation from donation after circulatory-determined death donors

PAPWORTH HOSPITAL

+33%

Outcomes of Donation After Circulatory Death Heart Transplantation in Australia

EXPERIENCE AUSTRALIENNE

+15%

Establishing a heart transplant programme using donation after circulatory-determined death donors: a United Kingdom based single-centre experience

MANCHESTER

+23%

CONCLUSIONS

- La perfusion ex-vivo permet une conservation quasi-physiologique du greffon cardiaque ainsi que une évaluation fonctionnelle objective

- L'intérêt de la perfusion ex-vivo devrait être analyse à l'échelle française avec une étude clinique multicentrique

- La perfusion ex-vivo pour les donneurs décédés d'un arrêt cardiaque est un véritable moyen pour augmenter les donneurs potentiels