



Quelles sont les limites du don d'organes après décès circulatoire en 2023?

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Plan de la présentation

- Conflits d'intérêts
- Limites médicales
- Limites financières
- Limites « politiques »



Conflits d'intérêt



Eurotransplant

Active waiting list (at year-end) in Belgium, by year, by organ

Active waiting list	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
kidney	791	770	878	871	797	849	824	914	952	1108
heart	76	95	89	118	117	103	111	91	110	111
lung	81	85	82	104	122	143	143	163	106	106
liver	181	184	187	188	174	201	189	172	181	193
pancreas	54	60	70	68	65	61	57	51	48	45
Total patients	1138	1141	1248	1288	1217	1292	1269	1341	1350	1514

statistics.eurotransplant.org : 3022P_Belgium : 23.05.2022 : patients waiting for multiple organs are counted for each organ

Waiting list mortality in Belgium, by year, by organ

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
kidney	30	28	27	44	35	37	36	32	37	34
heart	16	23	19	13	20	18	8	17	10	9
lung	11	16	11	1	7	10	8	7	11	11
liver	52	30	44	63	45	43	35	40	42	38
pancreas		2	4	4	2	4	2	1		2
Total events	109	99	105	125	109	112	89	97	100	94
Total patients	100	95	96	116	101	103	85	94	95	89

statistics.eurotransplant.org : 4512P_Belgium : 23.05.2022 : Reported by year of death. Includes patients with active or non-active urgency at removal. Includes removals while waiting for living or deceased donor transplants.

DCD: Classification Maastricht – Liège III - V

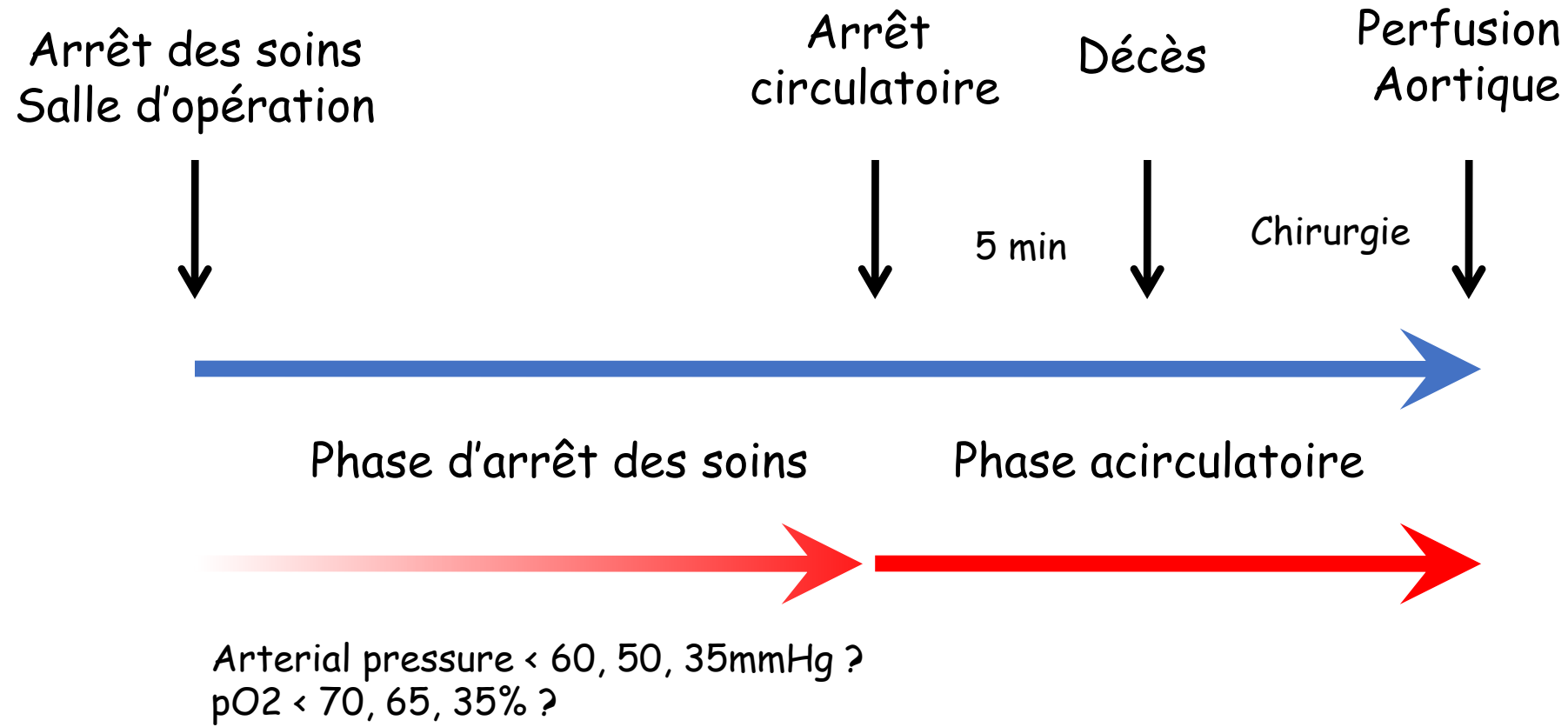
- Catégorie I: Constat de décès à l'arrivée des secours
- Catégorie II: Réanimation sans succès
- **Catégorie III: Retrait des thérapeutiques de support**
- Catégorie IV: Arrêt cardiaque chez un patient en mort cérébrale

- **Catégorie V: Euthanasie**

Kootstra et al. Transpl Proc, 1995

Detry et al. Transpl Proc 2012

DCD contrôlés: ischémie chaude de prélèvement (pWI)



DCD contrôlés

- Rein: augmentation de DGF et de PNF
- Foie: augmentation de EAD, de PNF et de lésions biliaires ischémiques
- Pancréas: ?
- Poumon: OK
- Cœur: ?

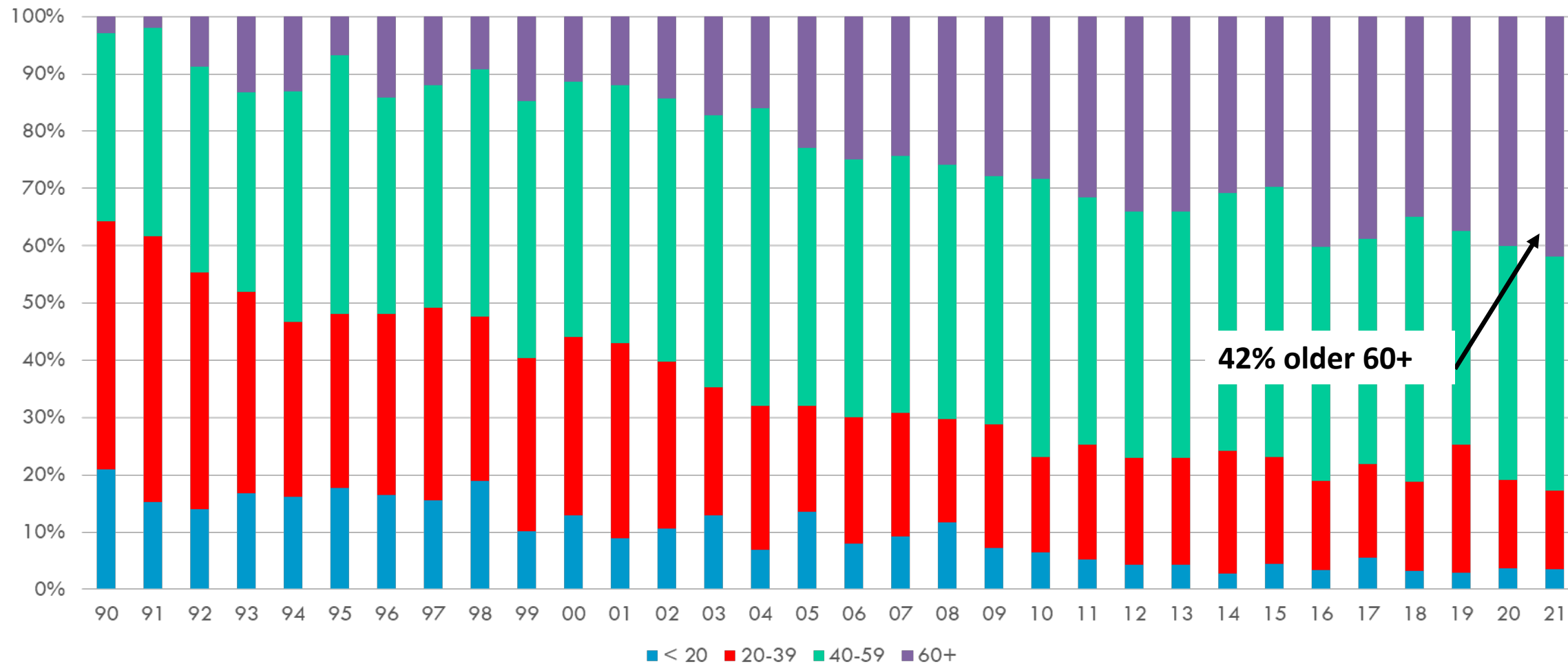
Expérience de DCD au CHU de Liège

- Limiter les lésions ischémiques (pWI<30 min, CI<4h)
 - prélèvement et transplantation par chirurgien expérimenté
 - prélèvement et transplantation en journée
 - priorité au bloc opératoire, avec salle d'op receveur libre au moment du prélèvement
- Pas de différences dans la qualité des donneurs par rapport à DBD
 - foie (âge, stéatose, fibrose)
 - rein (âge, facteurs de risques CV)
 - pancréas
 - cœur
- Receveur à faible risque immédiat et à bénéfice clair – allocation centre

Limites de DCD au CHU de Liège



Age des donneurs entre 1990 & 2021



42% older 60+

Note number of donors:

1994: 230

vs

2021: 280

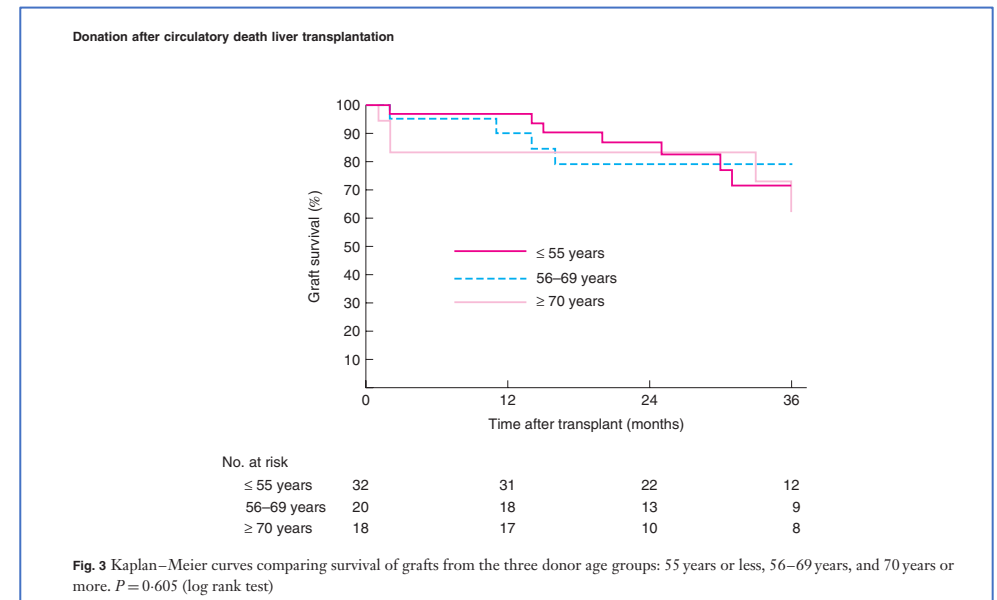
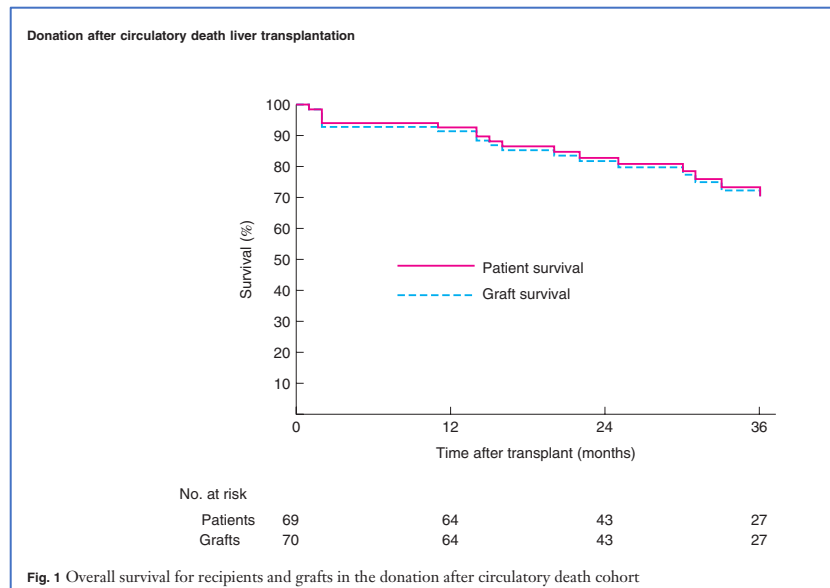
Donor age as a risk factor in donation after circulatory death liver transplantation in a controlled withdrawal protocol programme

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BJS 2014; **101**: 784–792



CASE REPORT

Successful heart transplantation from donation after euthanasia with distant procurement using normothermic regional perfusion and cold storage

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Mai-Linh Nguyen Trung⁸ | Arnaud Ancion⁸ | Raf Van den Eynde⁶ | Isabelle Lievens⁹ |
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Didier Ledoux¹⁰ | Filip Rega³

Am J Transplant. 2022;00:1–4.

While euthanasia has been legalized in a growing number of countries, organ donation after euthanasia is only performed in Belgium, the Netherlands, Spain, and Canada. Moreover, the clinical practice of heart donation after euthanasia has never been reported before. We describe the first case of a heart donated after euthanasia, reconditioned with thoraco-abdominal normothermic regional perfusion, preserved using cold storage while being transported to a neighboring transplant center, and then successfully transplanted following a procurement warm ischemic time of 17 min. Heart donation after euthanasia using thoraco-abdominal normothermic regional perfusion is feasible, it could expand the heart donor pool and reduce waiting lists in countries where organ donation after euthanasia can be performed.

KEYWORDS

cardiology, cardiovascular disease, clinical research practice, donors and donation: deceased, donors and donation: donation after circulatory death (DCD), ethics, ethics and public policy, heart transplantation, organ procurement, organ procurement and allocation

Machine Perfusion or Cold Storage in Deceased-Donor Kidney Transplantation

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BACKGROUND

Static cold storage is generally used to preserve kidney allografts from deceased donors. Hypothermic machine perfusion may improve outcomes after transplantation, but few sufficiently powered prospective studies have addressed this possibility.

METHODS

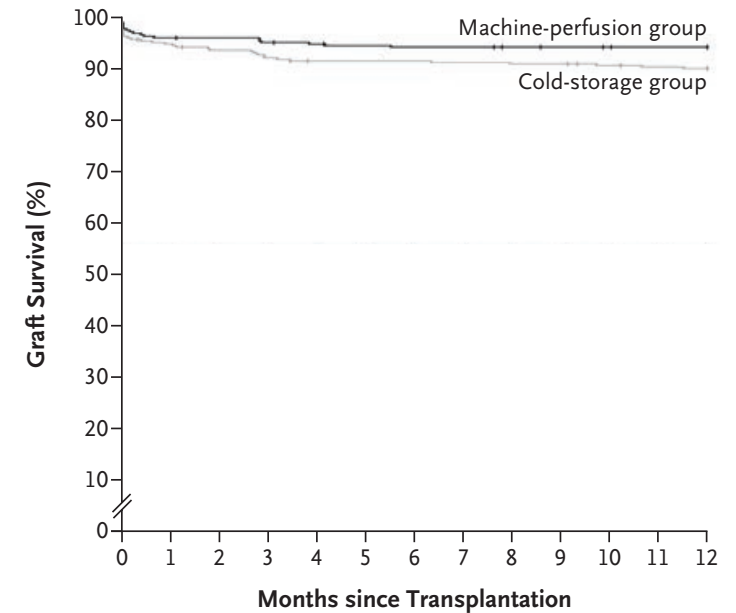
In this international randomized, controlled trial, we randomly assigned one kidney from 336 consecutive deceased donors to machine perfusion and the other to cold storage. All 672 recipients were followed for 1 year. The primary end point was delayed graft function (requiring dialysis in the first week after transplantation). Secondary end points were the duration of delayed graft function, delayed graft function defined by the rate of the decrease in the serum creatinine level, primary nonfunction, the serum creatinine level and clearance, acute rejection, toxicity of the calcineurin inhibitor, the length of hospital stay, and allograft and patient survival.

RESULTS

Machine perfusion significantly reduced the risk of delayed graft function. Delayed graft function developed in 70 patients in the machine-perfusion group versus 89 in the cold-storage group (adjusted odds ratio, 0.57; $P=0.01$). Machine perfusion also significantly improved the rate of the decrease in the serum creatinine level and reduced the duration of delayed graft function. Machine perfusion was associated with lower serum creatinine levels during the first 2 weeks after transplantation and a reduced risk of graft failure (hazard ratio, 0.52; $P=0.03$). One-year allograft survival was superior in the machine-perfusion group (94% vs. 90%, $P=0.04$). No significant differences were observed for the other secondary end points. No serious adverse events were directly attributable to machine perfusion.

CONCLUSIONS

Hypothermic machine perfusion was associated with a reduced risk of delayed graft function and improved graft survival in the first year after transplantation. (Current Controlled Trials number, ISRCTN83876362.)



No. at Risk

Machine-perfusion group	336	323	322	319	317	315	314	314	312	311	310	309	309
Cold-storage group	336	318	313	308	304	304	304	303	302	302	299	299	296

Figure 3. Graft Survival after Transplantation.

The rate of graft survival at 1 year in the machine-perfusion group was significantly higher than the rate in the cold-storage group (94% vs. 90%, $P=0.04$). Data on graft survival were censored at the time of death in patients who died with a functioning allograft.

Machine Perfusion or Cold Storage in Deceased-Donor Kidney Transplantation

N ENGL J MED 366;8 NEJM.ORG FEBRUARY 23, 2012

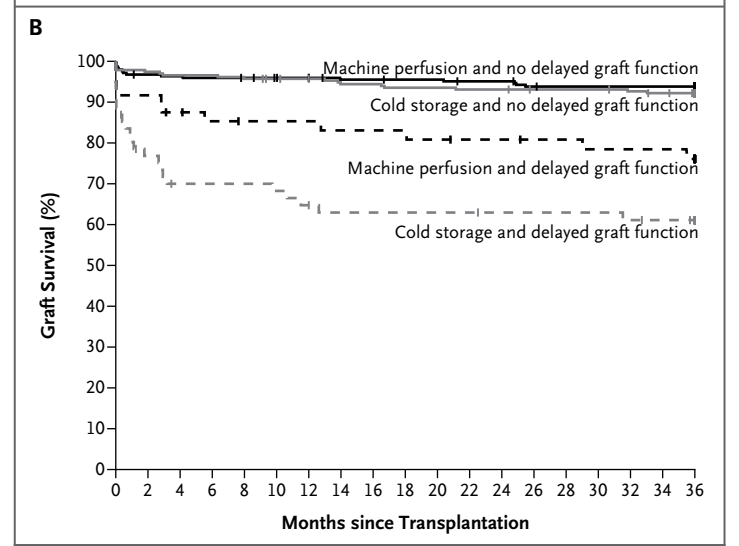
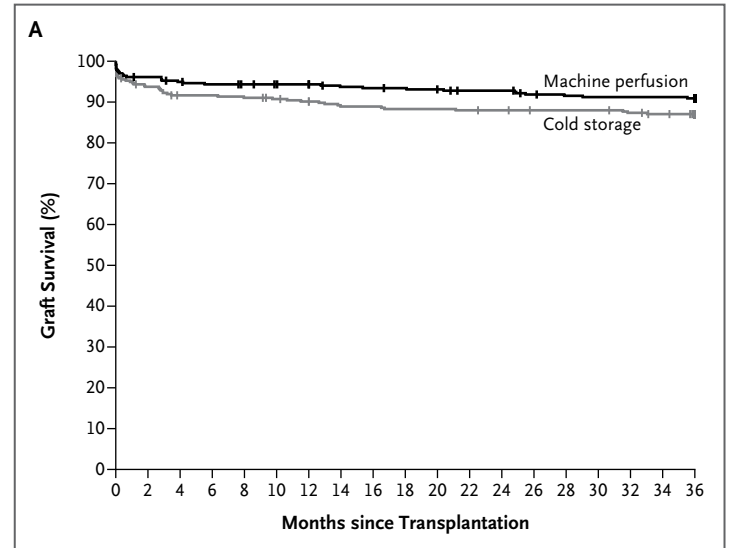


Figure 1. Graft Survival of Deceased-Donor Kidneys at 3 Years.

Panel A shows graft survival in 672 recipients in the main data set, with a hazard ratio for graft failure in the machine-perfusion group of 0.60 (95% confidence interval, 0.37 to 0.97; $P=0.04$). Panel B shows the post hoc analysis of a subgroup of 588 recipients of kidneys donated after brain death, with data split according to whether delayed graft function developed in the recipient. Delayed graft function was defined as the need for dialysis in the first week after transplantation.

ORIGINAL ARTICLE

Machine perfusion versus cold storage for preservation of kidneys from expanded criteria donors after brain death

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Summary

The purpose of this study was to analyze the possible effects of machine perfusion (MP) versus cold storage (CS) on delayed graft function (DGF) and early graft survival in expanded criteria donor kidneys (ECD). As part of the previously reported international randomized controlled trial 91 consecutive heart-beating deceased ECDs – defined according to the United Network of Organ Sharing definition – were included in the study. From each donor one kidney was randomized to MP and the contralateral kidney to CS. All recipients were followed for 1 year. The primary endpoint was DGF. Secondary endpoints included primary nonfunction and graft survival. DGF occurred in 27 patients in the CS group (29.7%) and in 20 patients in the MP group (22%). Using the logistic regression model MP significantly reduced the risk of DGF compared with CS (OR 0.460, $P = 0.047$). The incidence of nonfunction in the CS group (12%) was four times higher than in the MP group (3%) ($P = 0.04$). One-year graft survival was significantly higher in machine perfused kidneys compared with cold stored kidneys (92.3% vs. 80.2%, $P = 0.02$). In the present study, MP preservation clearly reduced the risk of DGF and improved 1-year graft survival and function in ECD kidneys.

Machine perfusion for ECD kidneys

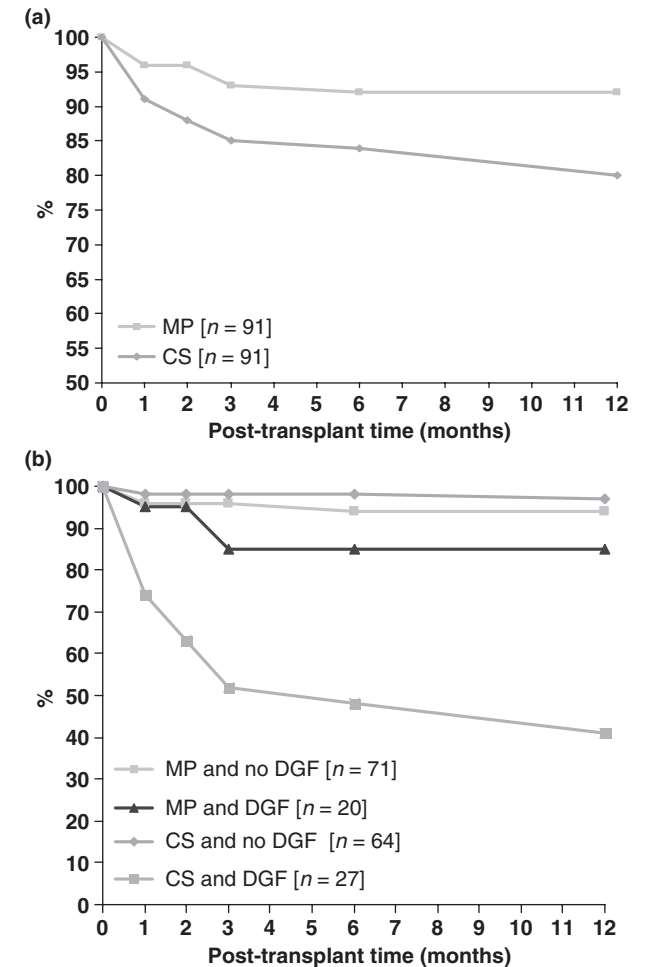


Figure 1 (a) Post-transplant graft survival rates. All consecutive renal transplants from heart beating (HB) expanded criteria donor (ECD) $N = 182$. Logrank test of equality machine perfusion (MP) versus cold storage (CS) $P = 0.02$. (b) Post-transplant graft survival rates. All consecutive renal transplants from HB ECD $N = 182$ – Logrank test of equality. Within CS group delayed graft function (DGF) versus no DGF $P < 0.0001$. Within MP group DGF versus no DGF $P = 0.164$. Within no DGF group MP versus CS $P = 0.48$. Within DGF group MP versus CS $P = 0.003$.

Perfusion des organes: questions?

- Hypothermie

- facilité
- peu de contrôle
- coût moins élevé
- solution « simple »
- sans ou avec oxygène
- peu de besoins

- Normothermie

- complexité
- contrôle de la fonction
- coût très élevé
- solution sanguine
- oxygène
- substrats
- amélioration

Machines de perfusion

- Hypothermiques
3.500€/rein



- Normothermiques
30.000€/organe

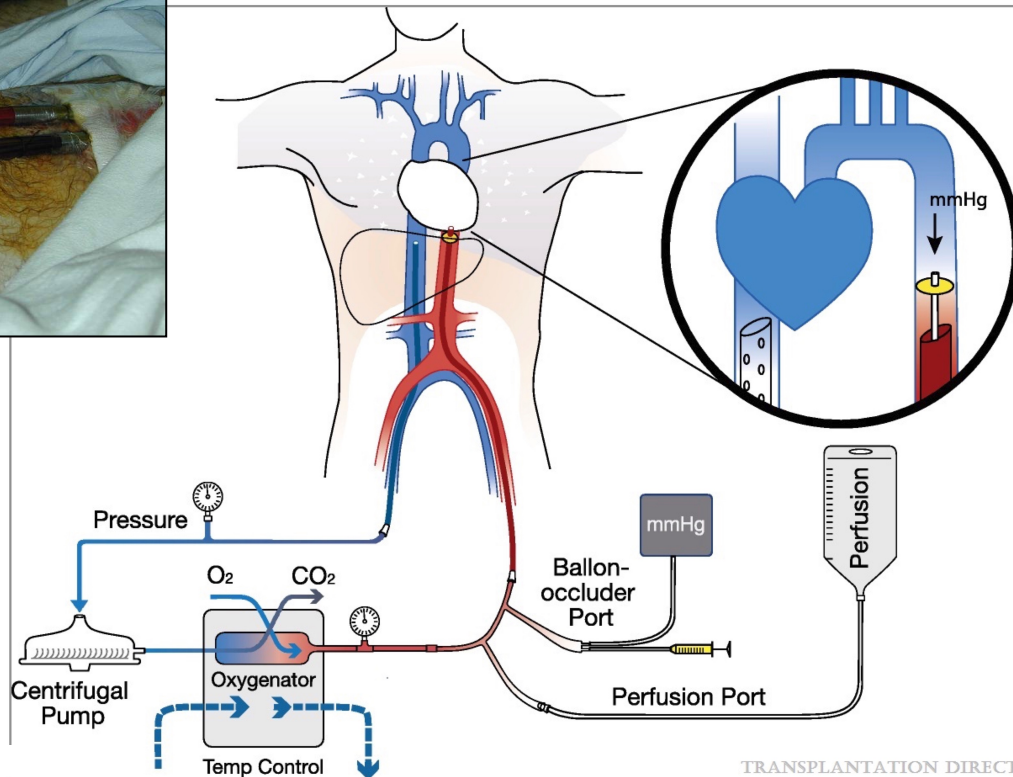
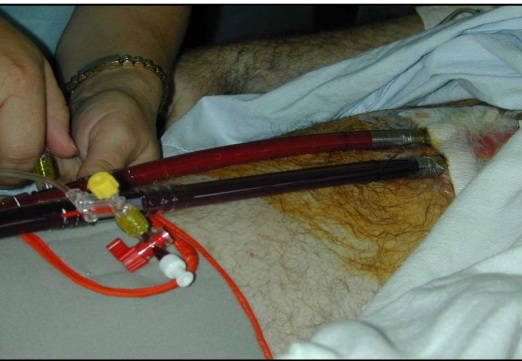


Coût de la perfusion des organes

- DCD reins hypothermie : $7000\text{€} / 2 \text{ reins} \times 125/\text{an} = 875.000 \text{ €}$
- DCD foie hypothermie : $4000\text{€} \times 125/\text{an} = 500.000 \text{ €}$
- DCD foie normothermie: $30.000\text{€} \times 125/\text{an} = 3.750.000 \text{ €}$
- DCD poumon & cœurs en normothermie:
 $30.000\text{€} \times 100/\text{an} = 3.000.000 \text{ €}$

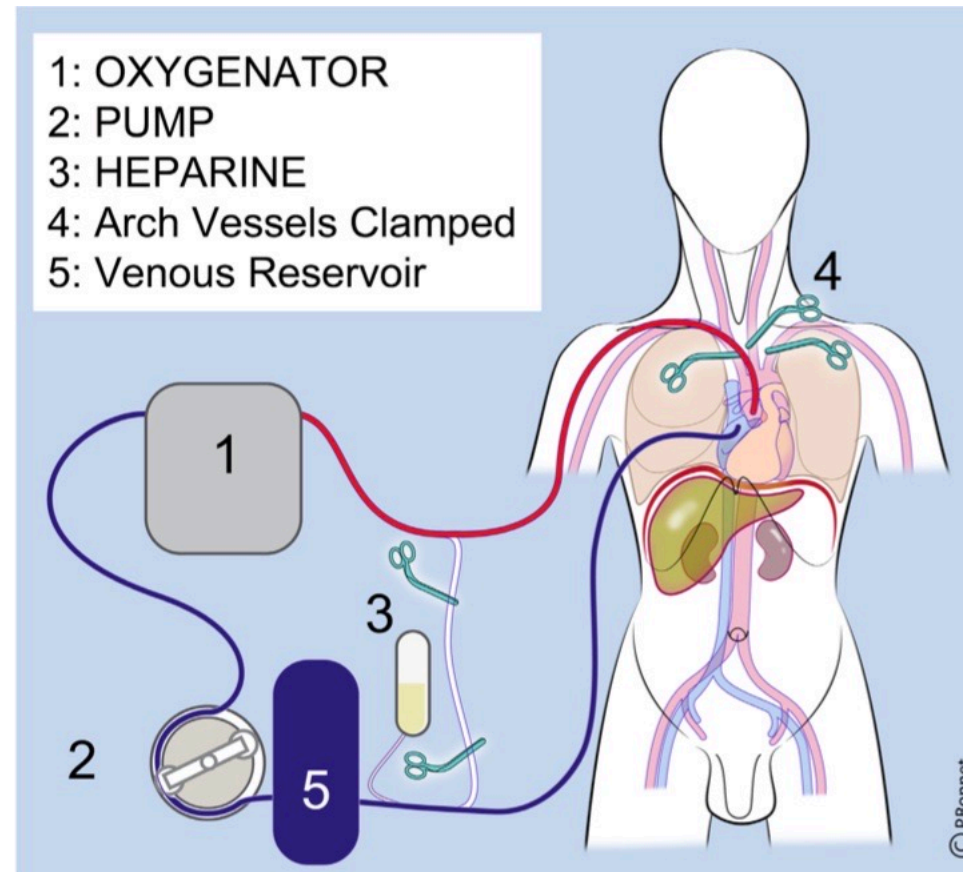
Prélèvement multiorganes DCD -

- Normothermic abdominal regional perfusion (N-ARP)



Prélèvement multiorganes DCD -

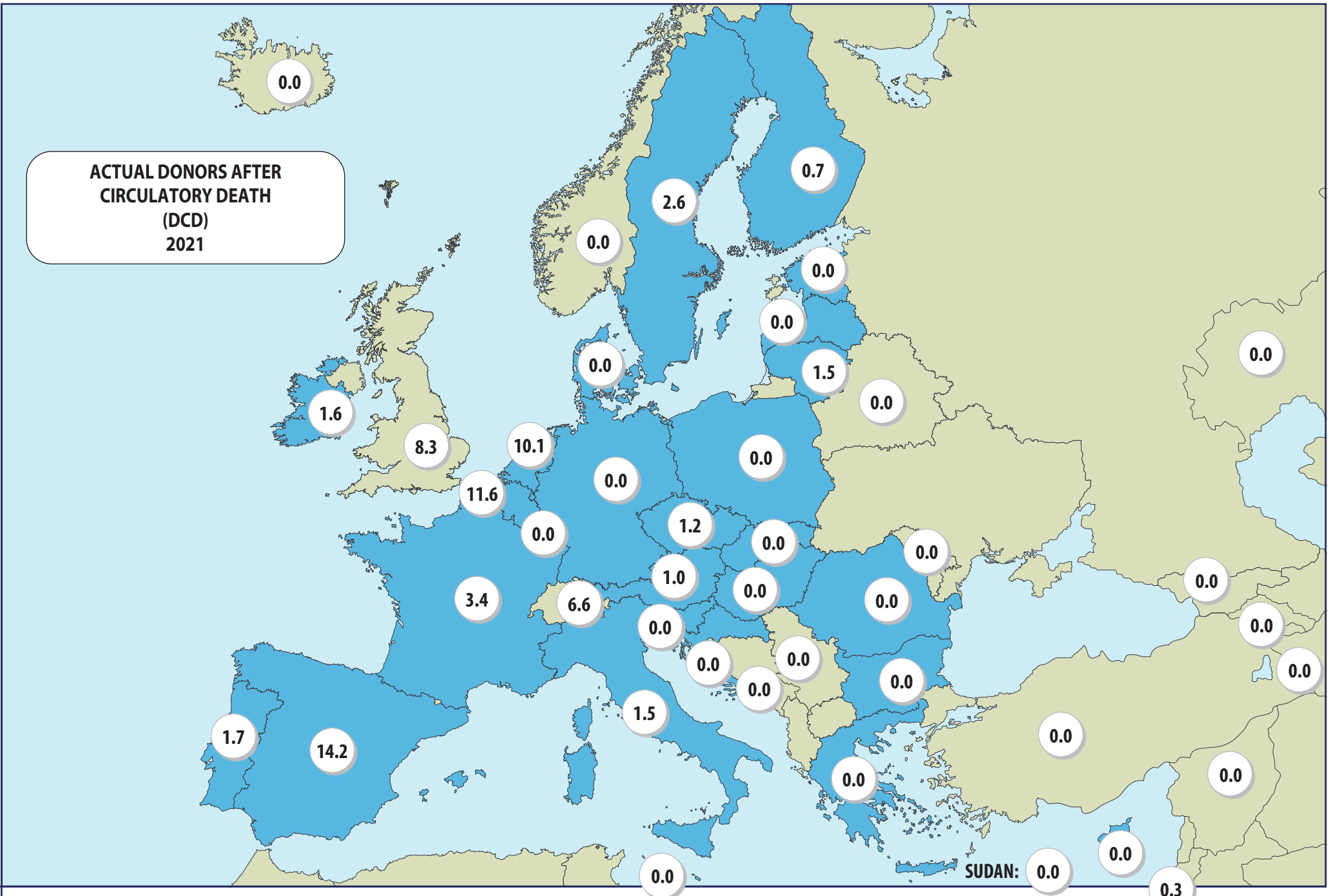
- **Normothermic thoraco - abdominal regional perfusion (N-TARP)**



Le futur du DCD est chirurgical et passe par la perfusion régionale normothermique !

- Critères DCD = critères DBD
- ECMO: 120 x 3.000€ : 360.000€
- Priorités au bloc opératoire pour réduire les ischémies pWI & CI
- Equipes chirurgicales et infirmières expérimentées tant dans les équipes de greffe que les équipes de prélèvement
- Mieux rémunérer les professionnels de la chaîne de transplantation, de la détection du donneur à la sortie du patient receveur de l'hôpital

**ACTUAL DONORS AFTER
CIRCULATORY DEATH
(DCD)
2021**



Donneurs d'organes en Belgique

- 2021: Belgique: 280 donneurs effectifs, 159 DBD & 121 DCD
- 2021: Liège: 58 (20%) donneurs effectifs, 29 DBD (18%) & 29 DCD (24%)
- Population Belge: 11.000.638
- Population Province de Liège: 1.082.136
- Taux de donneurs en Belgique: 25,4/million d'habitants
- Taux de donneurs en Province de Liège: 53,6/million d'habitants

Limites du DCD?

- Médicales: = DBD
- Financières: ECMO et perfusion régionale du donneur
- « Politique »
 - professionnaliser et motiver les équipes
 - donner la priorité aux prélèvements et aux transplantations
 - augmenter le nombre de prélèvements
 - informer de la possibilité de don d'organes après euthanasie



