Human heart transplantation from donation after circulatory determined death donors using normothermic regional perfusion : CHU of Liege experience

V Tchana-sato

Department of cardiovascular and thoracic surgery

University Hospital of Liege

Belgium

Université de Liège

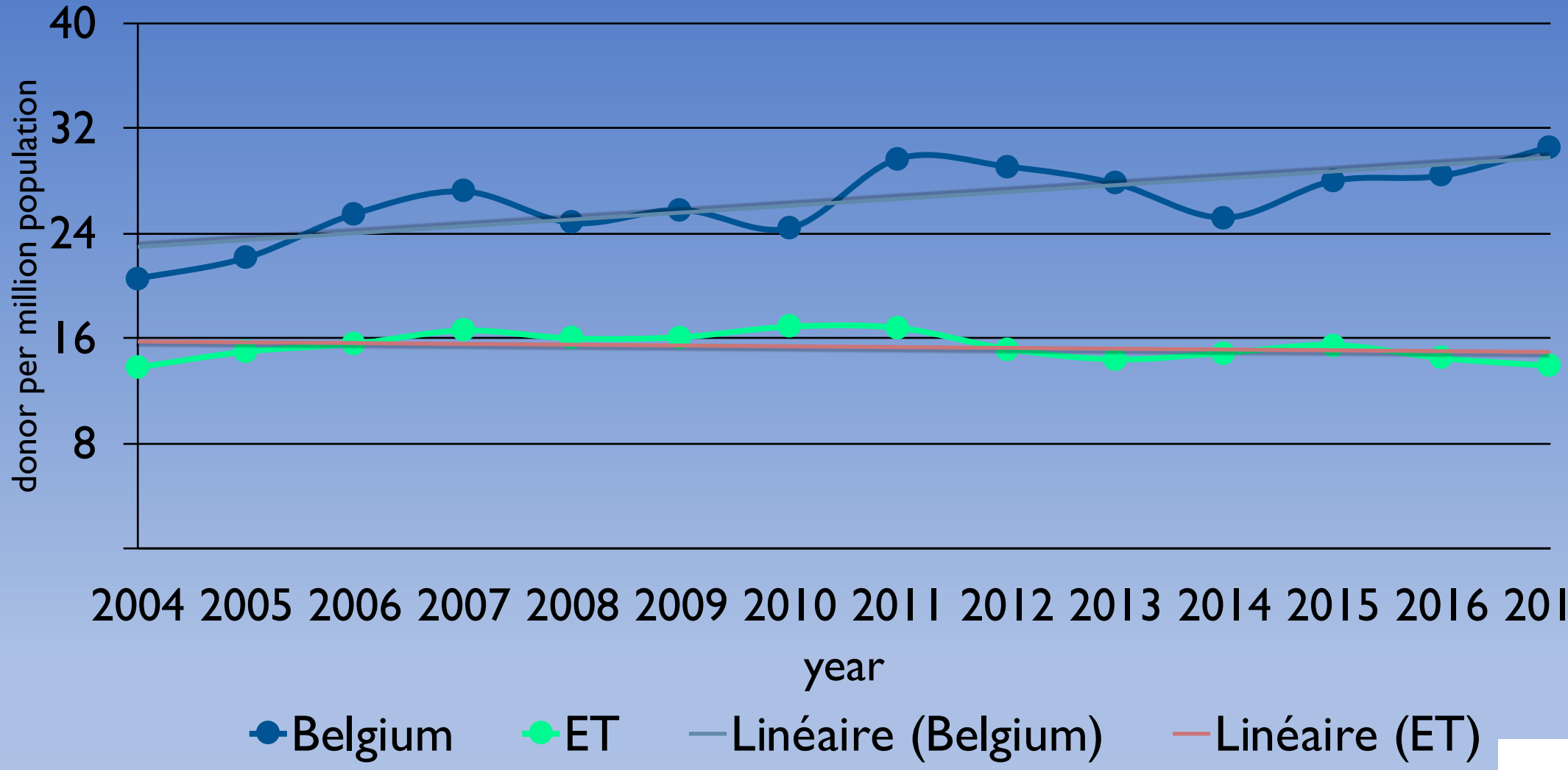
CHU de Liège

- I do not have any potential conflict of interest

- Our protocol has been approved by the ethics committee of our institution

Why a DCD heart transplantation program?

Organ donation per million population



30.6 dpmp

P=0.001

13.9 dpmp

P=0.389

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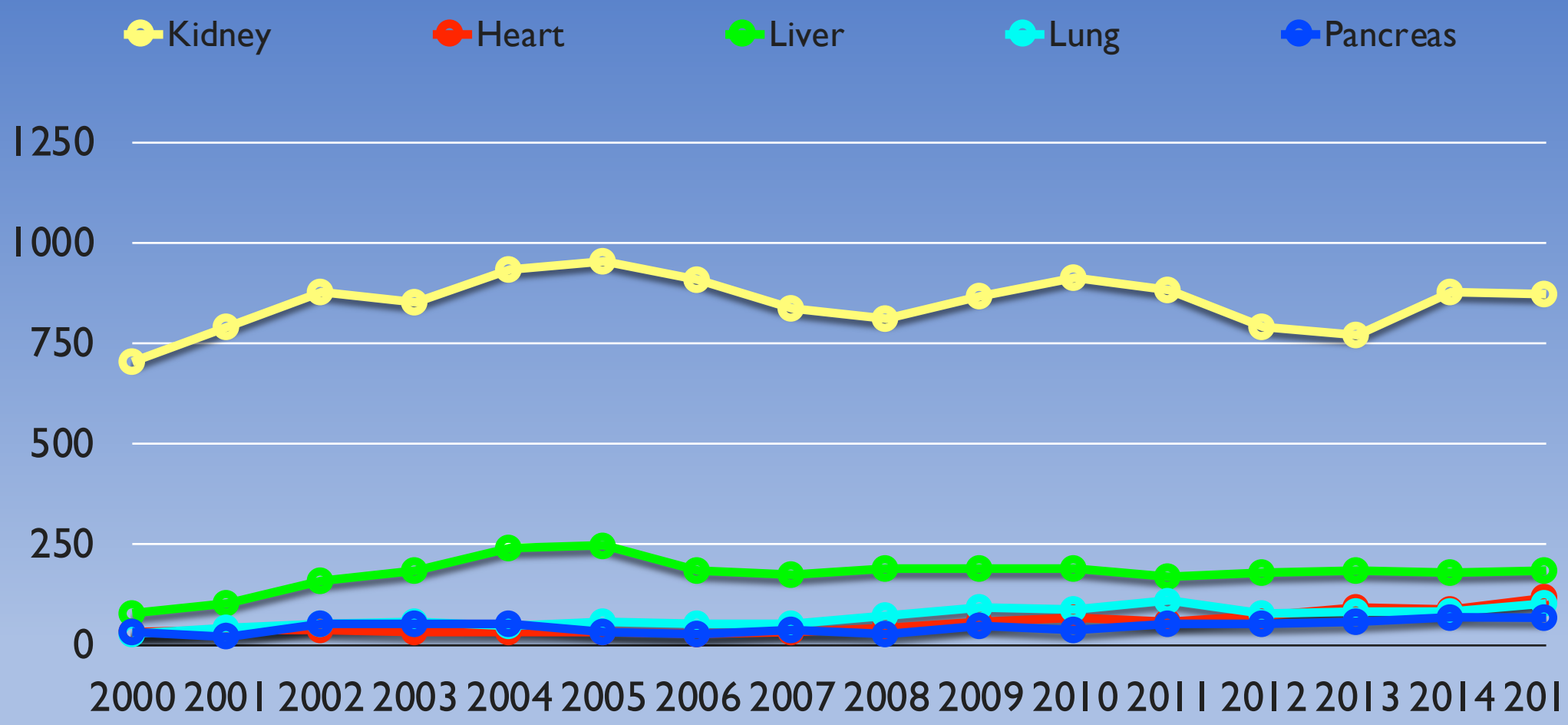
Patients on waiting list in Belgium



~ 1300 patients on waiting list

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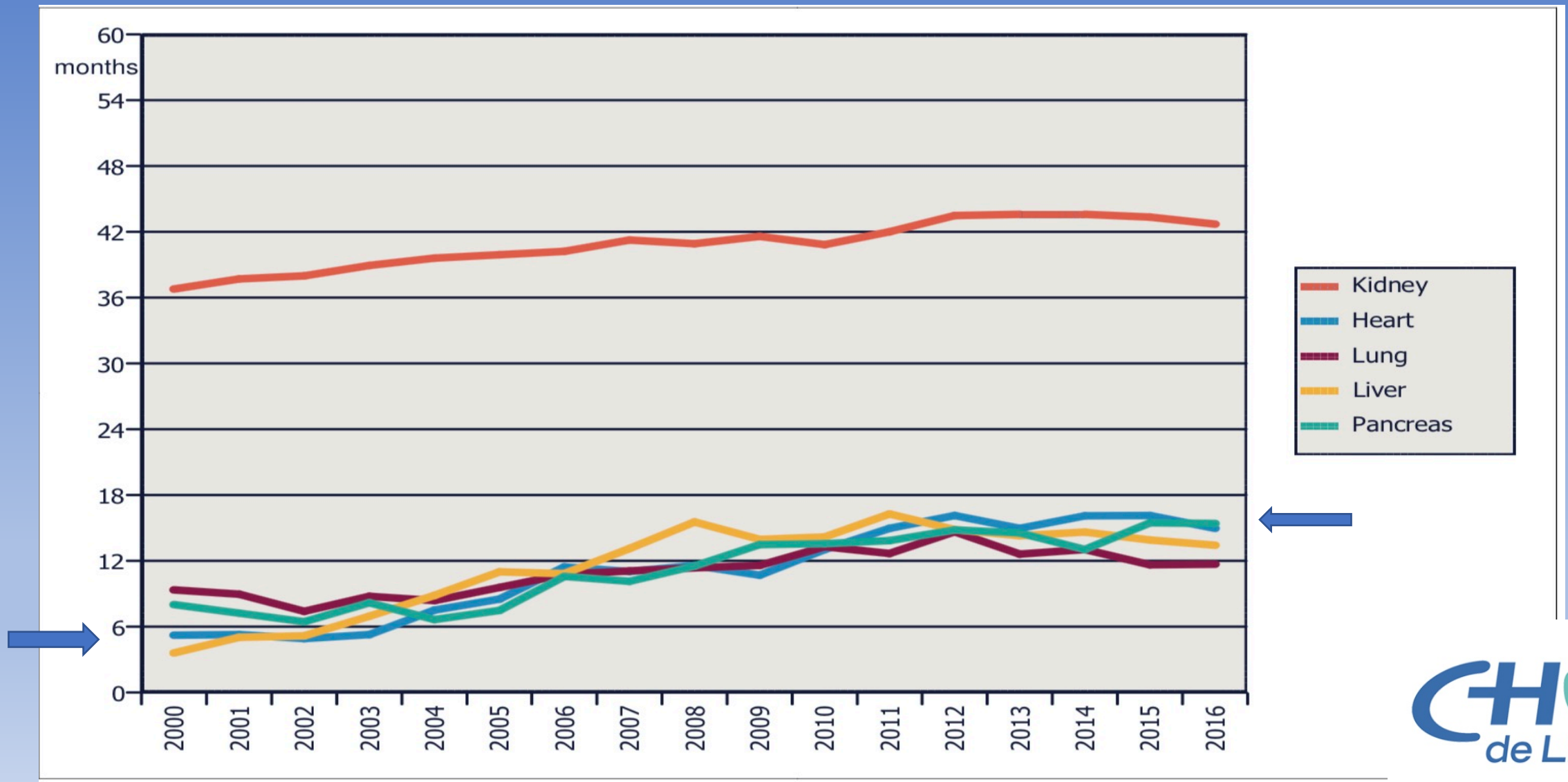
Median time on waiting list



Mortality on waiting list

Table 4.7b(ii) Mortality on the Eurotransplant waiting lists in 2016

Waiting list	A	B	D	H	HR	NL	SLO	Total
Kidney	25	34	434	40	4	66	1	604
Heart	8	20	113	10	9	3	6	169
Lungs	17	7	61	0	0	18	0	103
Liver	15	45	369	18	24	28	3	502
Pancreas	1	2	22	1	1	3	0	30
Total	**66**	**108**	**999**	**69**	**38**	**118**	**10**	**1408**
Total patients	**63**	**100**	**937**	**68**	**37**	**116**	**10**	**1331**

± 20 % of heart recipient candidates die on waiting list

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Experience with DCD donors organs transplantation since 2002

Transplant International

Transplant International ISSN 0934-0874

ORIGINAL ARTICLE

Liver transplantation from donation after cardiac death donors: initial Belgian experience 2003–2007

Olivier Detry,[1] Vincent Donckier,[2] Valerio Lucidi,[2] Dirk Ysebaert,[3] Thiery Chapelle,[3] Jan Lerut,[4] Olga Ciccarelli,[4] Jacques Pirenne,[5] Diethard Monbaliu,[5] Arnaud De Roover,[1] Pierre Honoré,[1] Xavier Rogiers,[6] Bernard De Hemptinne[6] and Roberto Troisi[6]

1 Department of Abdominal Surgery and Transplantation, CHU de Liège, University of Liège, Liège, Belgium
2 Department of Abdominal Surgery and Transplantation, Erasme Hospital, Free University of Brussels, Brussels, Belgium
3 Department of Abdominal Surgery and Transplantation, Antwerp University Hospital, University of Antwerp, Antwerp, Belgium
4 Department of Abdominal Transplantation, Cliniques Universitaires St Luc, Université Catholique de Louvain, Brussels, Belgium
5 Department of Abdominal Transplant Surgery, University Hospitals Leuven, Leuven, Belgium
6 Department of General & Hepatobiliary Surgery, Liver Transplantation Service, Ghent University Hospital & Medical School, Ghent, Belgium

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GUIDELINES FOR CLINICAL PRACTICE

Donation after cardio-circulatory death liver transplantation

Hieu Le Dinh, Arnaud de Roover, Abdour Kaba, Séverine Lauwick, Jean Joris, Jean Delwaide, Pierre Honoré, Michel Meurisse, Olivier Detry

Hieu Le Dinh, Arnaud de Roover, Pierre Honoré, Michel Meurisse, Olivier Detry, Department of Abdominal Surgery and Transplantation, University Hospital of Liège, University of Liège, 4000 Liège, Belgium
Abdour Kaba, Séverine Lauwick, Jean Joris, Department of Anesthesia and Intensive Care Medicine, University Hospital of Liège, University of Liège, 4000 Liège, Belgium
Jean Delwaide, Department of Hepatology and Gastroenterology, University Hospital of Liège, University of Liège, 4000 Liège, Belgium
Author contributions: Le Dinh H performed the literature review and wrote the manuscript; de Roover A, Kaba A, Lauwick S, Joris J, Delwaide J, Honoré P and Meurisse M constitute the team involved in the care of the liver transplant patients and they reviewed and commented the manuscript; Detry O supervised the review.
Correspondence to: Olivier Detry, Professor, Department of Abdominal Surgery and Transplantation, University Hospital of Liège, University of Liège, Sart Tilman B35, 4000 Liège, Belgium. oli.detry@chu.ulg.ac.be
Telephone: +32-4-3667645 Fax: +32-4-3667069
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Abstract

The renewed interest in donation after cardio-circulatory death (DCD) started in the 1990s following the limited success of the transplant community to expand the donation after brain-death (DBD) organ supply and following the request of potential DCD families. Since then, DCD organ procurement and transplantation activities have rapidly expanded, particularly for non-vital organs, like kidneys. In liver transplantation (LT), DCD donors are a valuable organ source that helps to decrease the mortality rate on the waiting lists and to increase the availability of organs for transplantation despite a higher risk of early graft dysfunction, more frequent vascular and ischemia-type biliary lesions, higher rates of re-listing and re-transplantation and lower graft survival, which are obviously due to the inevitable warm ischemia occurring during the declaration of death and organ retrieval process. Experimental strategies intervening in both donors and recipients at different phases of the transplantation process have focused on the attenuation of ischemia-reperfusion injury and already gained encouraging results, and some of them have found their way from pre-clinical success into clinical reality. The future of DCD-LT is promising. Concerted efforts should concentrate on the identification of suitable donors (probably Maastricht category III DCD donors), better donor and recipient matching (high risk donors to low risk recipients), use of advanced organ preservation techniques (oxygenated hypothermic machine perfusion, normothermic machine perfusion, venous systemic oxygen persufflation), and pharmacological modulation (probably a multi-factorial biologic modulation strategy) so that DCD liver allografts could be safely utilized and attain equivalent results as DBD-LT.

Key words: Non-heart-beating donation; Complication; Bile duct; Allocation; Ischemia; Ischemia-reperfusion injury; Liver disease

Peer reviewers: Bijan Eghtesad, Associate Professor, Department of General Surgery, Cleveland Clinic Foundation, 9500 Euclid Avenue, Cleveland, OH 44195, United States; Tokihiko Sawada, Associate Professor, Second Department of Surgery, Dokkyo University School of Medicine, Kitakobayashi 880, Mibu, Shimotsuga, Tochigi 321-0293, Japan; Philip Rosenthal, Professor, Pediatrics, UCSF, 500 parnassus Avenue, San Francisco, CA 94143-0136, United States

Le Dinh H, de Roover A, Kaba A, Lauwick S, Joris J, Delwaide J, Honoré P, M... O. Donation after cardio-circu... latory death li... 18(33): 4491-... com/1007-93... org/10.3748/wj...

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How to start ?

A dedicated multidisciplinary team

- Anesthetists
- Surgeons
- Intensivists
- Cardiologists
- Nurses
- Psychologist

Donor selection

	CHU LIEGE
Maastricht Criteria	III
Age	≤ 50
PMH	No known cardiac diagnosis
Inotropic support	< 0.3 mcg/Kg/min of noradrenaline
LVEF	> 50%
WIT	≤ 30 Minutes

Donor and recipient selection

- **Local donor and recipient at the beginning**

  -NRP

  -Short cold ischemic time

  -No need to use OCS

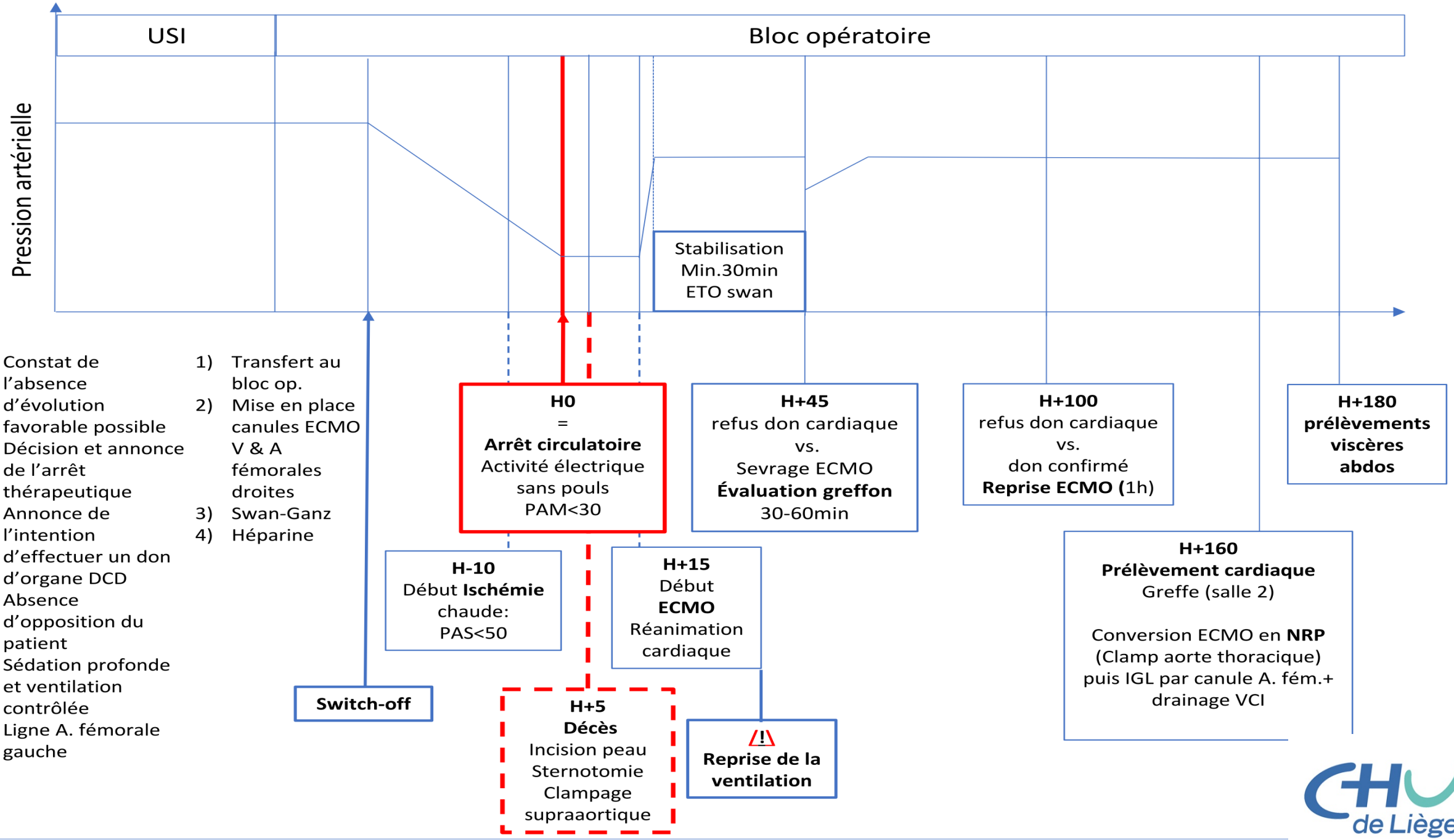
- **Extend to distal recipient with time and experience**

  -3rd recipient located in another center

  -NRP + cold storage

Elaboration of a Protocol

	CHU LIEGE	Papworth
Localization of withdrawal of life support therapy	Operating Room	ICU or anesthesia Room
Analgesia and sedation	ICU: at the discretion of the physicians OR: volatile anesthetic (sevoflurane)	
Normothermic regional perfusion	Premortem peripheral ECMO cannulas	Central NRP after the sternotomy
Heparin	IV 25000 UI bolus in the OR	30000 UI in the right atrium after the sternotomy
Circulatory arrest	Loss of arterial pulsatility and Mean arterial pressure< 30 mmHg	Mechanical asystole
Death	Circulatory arrest + 5 minutes	Circulatory arrest + 5 minutes
« Knife to skin »	Circulatory arrest + 5 minutes	Circulatory arrest + 5 minutes + OR transfer

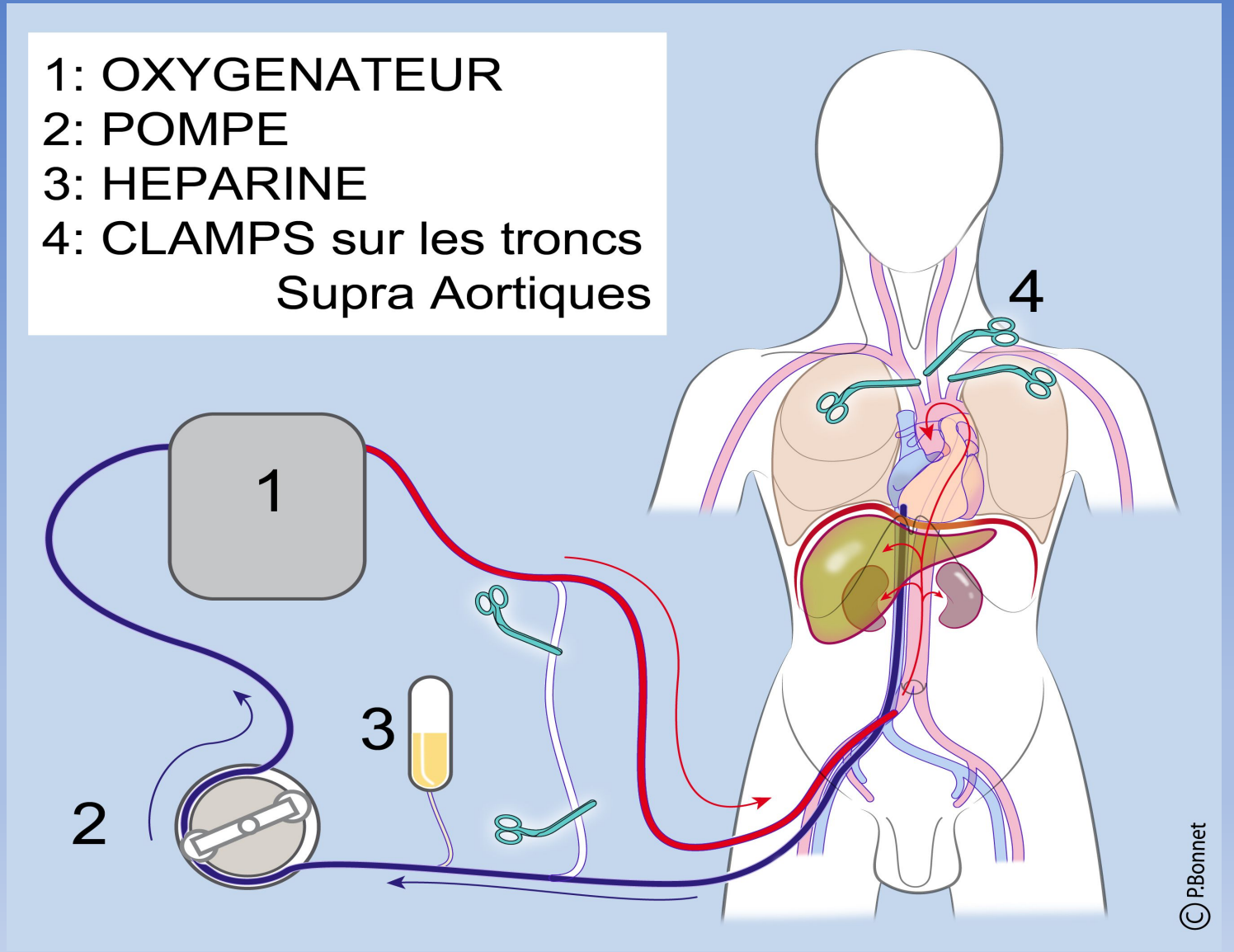

USI
Bloc opératoire
Pression artérielle
Stabilisation
Min.30min
ETO swan
1) Constat de l'absence d'évolution favorable possible
2) Décision et annonce de l'arrêt thérapeutique
3) Annonce de l'intention d'effectuer un don d'organe DCD
4) Absence d'opposition du patient
5) Sédation profonde et ventilation contrôlée
6) Ligne A. fémorale gauche
1) Transfert au bloc op.
2) Mise en place canules ECMO V & A fémorales droites
3) Swan-Ganz
4) Héparine
Switch-off
H0
=
Arrêt circulatoire
Activité électrique sans pouls
PAM<30
H-10
Début Ischémie chaude:
PAS<50
H+15
Début
ECMO
Réanimation cardiaque
H+5
Décès
Incision peau
Sternotomie
Clampage supraaortique
Reprise de la ventilation
H+45
refus don cardiaque
vs.
Sevrage ECMO
Évaluation greffon
30-60min
H+100
refus don cardiaque
vs.
don confirmé
Reprise ECMO (1h)
H+160
Prélèvement cardiaque
Greffe (salle 2)
Conversion ECMO en NRP
(Clamp aorte thoracique)
puis IGL par canule A. fém.+
drainage VCI
H+180
prélèvements viscères abdos

protocol

- Transfer ICU → OR
- Premortem ECMO cannulas insertion
- WLST
- Circulatory arrest + 5 minutes
- Sternotomy and clamping of arch vessels
- Start of NRP

Premortem Insertion of VA ECMO cannulas

- Minimize WIT
- Discussion with the ethics committee



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Donation after cardiac death: A 29-year experience

Janet M. Bellingham, MD, Chandrasekar Santhanakrishnan, MD, Nikole Neidlinger, MD, Philip Wai, MD, Jim Kim, MD, Silke Niederhaus, MD, Glen E. Leverson, PhD, Luis A. Fernandez, MD, David P. Foley, MD, Joshua D. Mezrich, MD, Jon S. Odorico, M Robert B. Love, MD, Nilto De Oliveira, MD, Hans W. Sollinger, MD, PhD, *and* **Anthony M. D'Alessandro, MD,** *Madison, WI*

donors in nearly all cases. Preapproval for femoral arterial and venous isolation or cannulation was included in the consent for DCD donation. Hepa-rin, 10,000–30,000 units as well as 10–20 mg of

From the Division of Organ Transplantation, University of Wisconsin School of Medicine and Public Health, Madison, WI

The Journal of TRAUMA® Injury, Infection, and Critical Ca

Extracorporeal Support for Organ Donation after Cardiac Death Effectively Expands the Donor Pool

Joseph F. Maggiocca, MD, John C. Magee, MD, Stephen A. Rowe, MD, Mark T. Gravel, RN, Richard H. Chenault II, Robert M. Merion, MD, Jeffrey D. Punch, MD, Robert H. Bartlett, MD, and Mark R. Hemmila, MD

J Trauma. 2005;58:1095–1102.

In Situ Preservation of Kidneys From Donors After Cardiac Death

Results and Complications

Maarten G. J. Snoeijs, MD, Angela J. E. Dekkers, MD,* Wim A. Buurman, PhD,* Luc van den Akker, MD,† Rob J. T. J. Welten, MD, PhD,‡ Geert Willem H. Schurink, MD, PhD,* and L. W. Ernest van Heurn, MD, PhD**

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Draft protocol by the belgian transplantation council and the belgian transplantation society

BELGIAN ADVISORY COMMITTEE ON Bioethics

Extra-corporeal membrane oxygenation can be done in DCD donors following pre-mortem cannulation prior to or after withdrawal of life-sustaining therapy in controlled and declaration of death in uncontrolled DCD donors, respectively. Cannulas are introduced into the femoral vessels and connected to the circuit. Importantly, recirculation of blood to the brain should be avoided by means of a balloon inserted via the contralateral femoral artery and inflated at the level of the diaphragm. This also excludes the perfusion of the thoracic organs. ECMO is initiated and normothermic preservation installed; some groups maintain temperatures

39

Final opinion

Opinion No. 63 of 12 October 2015 relating to certain aspects of the 'Donation after Circulatory Death' (DCD) draft protocol by the Belgian Transplantation Council and the Belgian Transplantation Society

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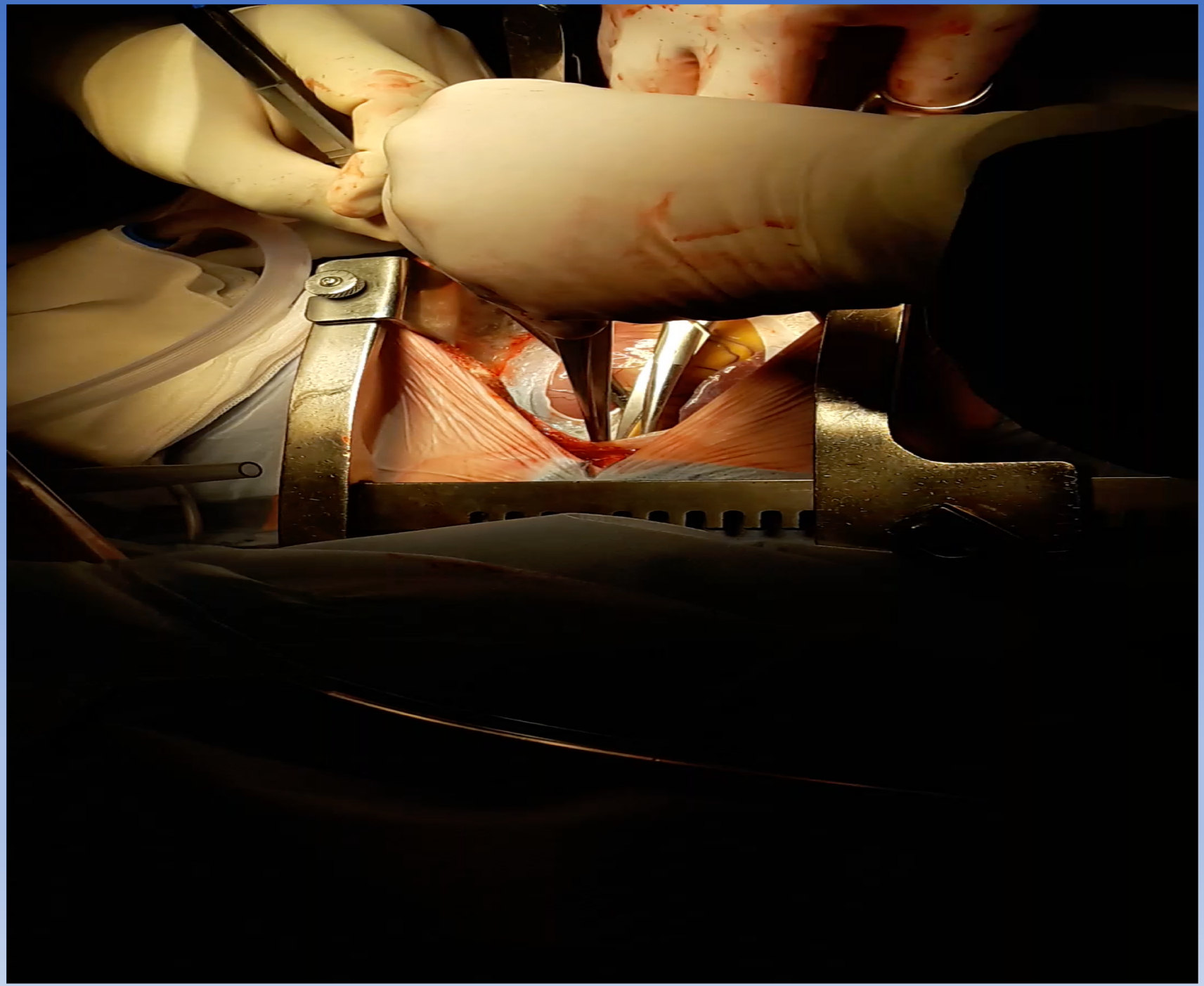

Our experience

	Donor 1	Donor 2	Donor 3
Age (years)	24	48	12
Gender	Male	Male	Male
Height (cm)	183	177	162
Weight (Kg)	59	94	42
Cause of WLST	Intracerebral hemorrhage	Intracerebral hemorrhage	hypoxic cerebral damage post hanging

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Conclusion

- DCD donor heart transplantation is a clinical reality > expand the organ donor pool
- Dedicated team
- Good donor and recipient selection
- Simple Protocol
- Ethical issues……

Thank You

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Criteria for transplantation

- MAP >60 mmHg and maximum of 5ug/kg/min of dopamine
- Sinus rhythm
- CI >2.5 l/min/m2
- CVP>12 mmHg
- CWP<15 mmHg
- LVEF>50%
- TEE (no valvulopathy, no segmental cinetic anomality)

	DONOR 1	DONOR 2
Age (years)	24	48
Gender	Male	Male
Height (cm)	183	177
Weight (kg)	59	94
Cause of WLST	Intracerebral hemorrhage	Intracerebral hemorrhage
WLST to circulatory arrest (min)	18	15
FWIT (min)	7	11
Knife to skin to onset of NRP (min)	2	6
NRP duration (min)	20	20
Restoration of spontaneous sinus rhythm after NRP (min)	1	1

	RECIPIENT 1	RECIPIENT 2
age	64	59
gender	M	M
height	181	177
weight	64	90
Etiology of Heart failure	Ischemic cardiopathy	Ischemic cardiopathy
Pulmonary vascular resistance	1.8	1.49
Cold ischemic time	16	17
Warm ischemic time	30	53
Post-transplant support	Dobutamine 5u/kg/min	Dobutamine 5u/kg/min Noradrenalin Isuprel
ICU lenght of stay	14	32
Hopital stay	31	54