ABSTRACT

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POSTER

POSTER SESSION
Over 1,200 DCD Donors in 23 Years: Increasing Both DBD and DCD Donation with Good Outcomes

Richard Hasz¹, John Edwards¹, Sharon West¹, Howard Nathan¹
Gift of Life Donor Program¹

BACKGROUND: To demonstrate that an effective DCD program leads to an increase in transplantable organs with good outcomes and simultaneously increases brain dead donors.

METHODS: This was a single OPO, multi-center study evaluating the procurement and utilization of DCD donor organs. Hospital education on early referral and DCD protocols was initiated prior to DCD implementation.

RESULTS: Since initiation of its DCD program in June 1995 through December 2017, this OPO procured 1,231 DCD donors. DCD donor procurement increased the donor pool by 14% and resulted in the transplantation of 2,201 organs. This increase was achieved while simultaneously achieving a 103% increase in annualized DBD procurement for 2017 versus 1995. There were 1,045 (85%) controlled and 186 (15%) uncontrolled DCD recoveries. Mean donor age was 38 years (r = 0.5 - 76). Mean warm ischemic time (WIT) for kidneys transplanted (N=1,924) was 33 minutes (r = 2 - 214). Mean WIT for livers transplanted (N=234) was 23 minutes (r = 2 - 69). Kidney ATN rate was 53% and kidney graft survival was 89% at 1 year, 80% at 3 years and 70% at 5 years. Liver graft survival was 75% at 1 year, 65% at 3 years and 58% at 5 years.

CONCLUSION: An effective DCD program increased the donor pool by 14%. Increases in DCD donor procurement was achieved while simultaneously achieving a 103% increase in DBD donors over the evaluation period. Effective implementation of a DCD protocol can be achieved without compromising the brain dead organ donor pool.

<table>
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<th>Year</th>
<th>Total Donors</th>
<th>DBD Donors Procured (% of Total Donors)</th>
<th>DCD Donors Procured (% of Total Donors)</th>
<th>DCD Kidney Utilization (Transplanted/Procured)</th>
<th>DCD Liver Utilization (Transplanted/Procured)</th>
<th>DCD Pancreas Utilization (Transplanted/Procured)</th>
<th>DCD Lung Utilization (Transplanted/Procured)</th>
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<td>-</td>
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<td>67 (17%)</td>
<td>122/132 (92%)</td>
<td>16/26 (78%)</td>
<td>2/2 (60%)</td>
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<td>11/21 (52%)</td>
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<td>443 (82%)</td>
<td>97 (18%)</td>
<td>141/162 (73%)</td>
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<td>2017</td>
<td>565</td>
<td>447 (78%)</td>
<td>116 (21%)</td>
<td>184/256 (72%)</td>
<td>25/35 (71%)</td>
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<td>1221 (14%)</td>
<td>1824/2431 (78%)</td>
<td>234/451 (52%)</td>
<td>18/40 (40%)</td>
<td>27/71 (38%)</td>
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COMPARATIVE ANALYSIS BETWEEN FAMILY INTERVIEWS FOR DONATION BETWEEN UNCONTROLLED AND CONTROLLED DONATION AFTER CARDIAC DEATH

Alonso A Mateos Rodriguez1 4, Manuel Aparicio Madre1, Concepción Diez Collar1, Juan Ignacio Torres González1, Jorge Duerto2, Marisol Vereda3, Francisco del Rio1.

2. Coordinación de trasplantes. HU 12 de octubre.
3. Coordinación de trasplantes. HU Clínico San Carlos.

OBJECTIVE: To know the characteristics of the interviews for donation between controlled donation after cardiac death (CDCD) and uncontrolled (UDCD)

MATERIAL AND METHOD: Record of all interviews produced from the year 2013 to 2017.

RESULTS: 184 CDCD interviews and 314 of UDCD. The percentage accepted was 90% in CDCD and 83% in UDCD. The average number of interviews in case of acceptance was 1.6 in CDCD and 2 in UDCD. In case of refusal, the average number of interviews was 1.2 in CDCD and 2.9 in UDCD. In CDCD, the ICU doctor reports the death, while in UDCD he is the transplant coordinator. In CDCD as well as in UDCD, the one that requests the donation is the transplant coordinator usually. The number of interlocutors in DCDC was 3.3 in accepted versus 3 in the denied ones (p = 0.01). The number of interlocutors in UDCD was 3.4 in accepted and 3.3 in denied (p = 0.69). The main interlocutor was the spouse in both cases, but the second most frequent was a son in CDCD and a brother in UDCD. In CDCD there was a 3% non-receptivity compared to 14% in UDCD. The most frequent acceptance moment was after receiving initial information. In CDCD there is a 20% spontaneous offer compared to 1% in UDCD. The most frequent reason for refusal in both cases was negative in life.

CONCLUSIONS: In both types of donation, family refusal rates are low. There is a greater number of interviews in cases of denial in UDCD and in this case it is more usual to report the death of the transplant coordinator. There are changes in the second most frequent interlocutor and in cases of non-receptivity of the family.
Actual ethical issues for use of ECMO in organ donation (OD)

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¹Organ Transplant Department, Pavlov First State Medical University, St Petersburg, Russian Federation
²Organ Procurement Center, St Petersburg State Research Institute for Emergency, Russia Federation
³Institute of Philosophy, Russian Academy of Sciences, Moscow, Russia Federation

**Background.** There are the discussions about ethical issues raised by use the ECMO for OD have been continued. These questions referred to autonomy of person, informed or, presumed consent on the pre-mortem manipulation and to the time of switching of perfusion procedure from resuscitative manner to the organs-saving way of perfusion.

**Methods.** There were performed 31 procedures of ECMO for in situ perfusion resuscitation of organs in donors with sudden irreversible cardiac arrest (ICA) (WIT 60min), from 2009. In this period, the logistic model was “in hospital switch on ECMO by outside procurement team”. That way reduced the time for resuscitation organs in dead person with CA. ICUs and emergency rooms should be equipped by portable perfusion systems (PPS) for risqué ECMO starting. That is possible only in case of using ECMO not only for OD, but is life support. In case of failed ECMO CPR perfusion team could start program for OD.

**Results.** From our practical work and future perspectives the following questions were raised (professionals, bioethics, lawyers and patients networks): where is the trigger of the donors perfusion program; who should connect the devices to restore blood circulation; how should be declared the death on (mCPR), ECMO, LVAD, TAH, etc.

**Conclusion.** The most promising resources for OD are donors with ICA on ECMO-CPR. Perhaps we should develop new standard procedure for detecting "brain death" (cerebral angiography). All of that could be done on the base of detailed sociohumanitarian research works, taking in consideration the public opinion.

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DONORS AFTER CARDIOPULMONARY RESUSCITATION

Jose M Navalpotro Pascual, Alicia Villar Arias, Lucia Gnecca, Alonso Mateos

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2 Servicio de Urgencias. HU Infanta Sofia
3 Oficina Regional de Coordinación de Trasplantes. Consejeria de Sanidad. Comunidad de Madrid
4 Facultad de medicina. Universidad Francisco de Vitoria. Madrid.

Introduction:

In Madrid, extrahospitalary medical emergency services has an important role in donation processes in uncontrolled asystole, but also in the donation for brain death and controlled asystole in many cases although indirectly. Many of the patients recovered from out-of-hospital cardiorespiratory arrest (CRP) then die in the hospital and are donors.

Objective:

Knowing the number and characteristics of patients who have been recovered from an extrahospitalar PCR, they die in the hospital and are organ donors.

Material or patients and method:

Retrospective analysis of patients who have undergone a hospital extra-hospital PCR for one year. We recorded: sex and age, date of the event, if cardiopulmonary resuscitation (CPR) maneuvers were performed, as a result of this, the patient’s condition at discharge, if there was donation and organs removed.

Results:

We analyzed 1830 PCR treated by SUMMA 112 from April 1, 2017 to March 31, 2018, in which CPR or post-resuscitation care has been performed in 1101 occasions. Of these patients, 424 were hospitalized, of whom 137 were discharged from the hospital, 61 did not know the result and the rest (226) died in the hospital. Of the 226 who died in the hospital, 23 were donors in brain death and 19 in controlled asystole. As a result of these donations and medical assistance were obtained 69 kidneys, 20 lungs, 30 liver, 4 pancreas, 10 hearts and a pancreas and a stomach.

Conclusion:

Patients suffering from out-of-hospital cardiac arrest and pulse recovery are an important source of donor organ donation for brain death and controlled asystole donation.
Arterial Blood Pressure (ABP) during normothermic Regional Perfusion (nRP): any role for monitoring and vasopressors?

Francesca Baroncelli 1, Marco Vergano 2, Alice Cavallo 1, Diego Artusio 2, Maria Elena De Piero 2, Luca Brazzi 1

1 Department of Surgical Sciences, University of Turin, Torino, Italy
2 Department of Anesthesia, Intensive Care and Emergency, San Giovanni Bosco Hospital, Torino, Italy

Much has been written on extracorporeal interval support for organ retrieval; however, little is known about the best strategies to reach key hemodynamic targets during nRP.

We performed a systematic search of the literature in Medline and EMBASE databases using MeSH terms “Tissue and Organ Procurement”, “Extracorporeal Circulation”, “Organ Preservation” and combinations thereof. We manually searched the reference lists of selected studies and publicly available documents from professional organizations and government agencies. Eligibility criteria included: adult DCD donors managed with nRP; procurement of abdominal organs; English, Italian or Spanish language. The search yielded 805 results; 48 papers were included for review. Of these, only 4 articles explicitly reported on ABP monitoring in the femoral artery; none mentioned the administration of vasopressors during nRP.

A “sepsis-like” state has been described in resuscitated patients post-cardiac arrest, where the dysregulated production of cytokines contributes to microcirculatory abnormalities and organ dysfunction. Meanwhile, improved microcirculatory variables have been reported when higher mean arterial pressure (MAP) values are targeted after ischemia-reperfusion injury in both human and animal studies. While increased pump flow-rates during nRP may improve DO2 and reduce central venous pressure (CVP), vasopressors such as noradrenaline may increase MAP without significantly affecting CVP, thereby increasing splanchic mean perfusion pressure. In two cases at our institution, a sustained lactate clearance was obtained despite a prolonged warm ischemic time, using intermittent ephedrine boluses alongside volume and blood flow setting in order to maintain higher MAP values on ABP monitoring. Further research is needed to establish the potential role of vasopressors during nRP.
Lung transplantation after ex vivo lung perfusion: a monocentric midterm follow-up

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1. Ospedale Maggiore Policlinico, Thoracic Surgery and Lung Transplant Unit, Milan, Italy
2. Ospedale Maggiore Policlinico, Department of Anesthesia and Critical Care, Milan, Italy
3. Ospedale Maggiore Policlinico, Department of Pathophysiology and Transplantation, Respiratory Unit and Regional Adult Cystic Fibrosis Center, Milan, Italy

Background
Ex Vivo Lung Perfusion (EVLP) is a valuable tool for the reassessment of marginal lungs before transplantation and can increase the pool of available organs. Moreover, in a setting of donation after circulatory death (DCD), lung evaluation by EVLP is advisable, before proceeding to transplant. The aim of this study was to investigate the characteristics of the recipients of EVLP assessed grafts and their outcomes.

Methods
A retrospective study was conducted including all lung transplant (LuTx) recipients from January 2011 to June 2017 in our centre. Two groups of patients were identified based on their graft: EVLP assessed (Group A) or not (Group B). All data were statistically analysed with SPSS Version 22 for Macintosh.

Results
In the study period, a total of 146 LuTx were performed; of those, 20 grafts underwent EVLP reconditioning, 18 from donation after brain death (DBD), 2 from DCD. There weren’t statistical differences in the two groups regarding demographic data, LAS score, type of transplant, pre- and intra-operative extracorporeal membrane oxygenation (ECMO). EVLP grafts had early perioperative results, incidence of PGD3, mortality rate and other medium and long-term outcomes comparable to group B transplantations; in particular, no difference was found between the two groups in terms of survival.

Conclusion
EVLP reconditioning can increase the number of available grafts, with similar outcomes and survivals, compared to conventional grafts. The experience gained on DBD promoted the procedure even in DCD after a “no-touch” time of 20 minutes, necessary for legal declaration of death in Italy.
Is Abdominal Normothermic Regional Perfusion compatible with concurrent Direct Procurement and Machine Preservation of the heart in DCD donation?

Hannah Esser¹, Katherine Ember², John Hallett², Fiona Hunt¹, Stephen J. Wigmore¹, Rachael Gregson³, Eddie Clutton³, Gabriel C. Oniscu¹

¹ Edinburgh Transplant Centre, Royal Infirmary of Edinburgh
² Centre for Regenerative Medicine, University of Edinburgh
³ Welcome Trust Critical Care Laboratory for Large Animals, Roslin Institute, Edinburgh

Background: Direct procurement and machine preservation (DP-MP) of heart in DCD donation involves rapid removal of the heart with removal of 1-1.2 litres of donor blood to allow ex-situ machine preservation. It is yet unclear if this technique can be undertaken concomitantly with Abdominal Normothermic Regional Perfusion (A-NRP) given the reduced circulatory volume to sustain abdominal organ perfusion.

Material & Methods: In a translational pig model the study group (N=5) had 10% of the blood volume removed prior to A-NRP to simulate heart DP-MP. The control group consisted of 4 pigs (N=4). Blood gas analysis and biochemistry samples were taken at baseline and every 30’ during A-NRP.

Results: Pigs in the study group had significantly lower hemoglobin levels at start of the intervention (Hb: 5.16 vs Hb: 8.30; p=0.01) and received more volume replacement with a mean of 1.60L of whole blood (SD: 1.22; range: 3.10) and 4.82L fluids (SD: 2.30; range: 4.40) (plasmalyte, gelofusine). The control group received a mean of 2.23L (SD: 0.69; range: 1.44) of fluids. Yet in both groups arterial oxygen saturations maintained stable (>95%) during A-NRP.

Liver function tests were comparable in the two groups. After an initial peak, transaminases, cholestasis parameters as well as lactate levels improved throughout the duration of A-NRP. There was also no difference between kidney parameters in the two groups (urea and creatinine levels).

Conclusion: A-NRP with simultaneous DP-MP retrieval of the heart is technically more challenging and requires rapid volume replacement on the NRP circuit. However, there is no detrimental impact on the function of the abdominal organs.
Normothermic Regional Perfusion Enables Preservation of DCD Hearts in Cold Storage and Causes Limited Injury to the Donor Lung.

Juglans S Alvarez¹, Roberto V P Ribeiro¹,², Bruno Gomes³, Rafaela V P Ribeiro²,³, Vinícius Michaeisen³, Frank Yu¹, Mitchell B Adamson¹,², Emanuela Paradiso⁴, Massimiliano Meineri⁴, Heather Ross²,⁵, Marcelo Cypel²,³, Vivek Rao¹,², Mitesh V Badiwala¹

¹Division of Cardiovascular Surgery, Toronto General Hospital, University Health Network
²Institute of Medical Science, University of Toronto
³Division of Thoracic Surgery, Toronto General Hospital, University Health Network
⁴Department of Anesthesia and Pain Management, Toronto General Hospital, University Health Network
⁵Division of Cardiology, Toronto General Hospital, University Health Network

Background: Normothermic Regional Perfusion (NRP) is part of the graft resuscitation and management strategies in DCD heart transplantation. We investigated whether cold storage was possible for DCD hearts following NRP and if NRP would cause injury to donor lungs.

Methods: Donor pigs underwent hypoxic cardiac arrest followed by 15 min of warm ischemia and resuscitation with NRP. Hearts were preserved with HTK at 4°C (DCD-HTK, n=5) for up to 3h and transplanted. Conventional beating-heart donations preserved in HTK at 4°C were used as controls (n=4). Lung biopsies were taken from the DCD-HTK group before and after NRP and assessed for IL-1b and IL-8 production. Mixed venous and left atrial blood gas samples were collected pre and post NRP.

Results: DCD-HTK hearts showed initial dysfunction following reperfusion with significant recovery at 3h post-transplant. No significant differences were seen between DCD-HTK and controls post-transplantation (Cardiac index: Control 49.5±6%, HTK 48.5±5% of baseline; p=0.376). Lungs showed significant increase in IL-1b and IL-8 production; however, they maintained a normal PaO₂/FiO₂ ratio following NRP.

Conclusion: DCD hearts stored using a standard preservation solution demonstrated comparable post-transplantation function to controls. Thus, short periods of cold storage following successful NRP and documented adequate function is an acceptable strategy for DCD hearts. Although significant increase in proinflammatory cytokine production was noted, donor lungs demonstrated preserved function following NRP. These findings suggest that transplantation criteria will be met under this strategy. Further testing will help determine if these organs can benefit from an ex vivo perfusion reconditioning period.
Abstract session 2: LUNG AND HEART TRANSPLANTATION FROM DCD

MILAN SEPTEMBER 13-14, 2018

Figure 1. A-C: Cardiac functional comparison between Control and HTK groups. A. Cardiac index. B. Preload recruitable stroke work. C. Right ventricular stroke work index. Overall, DCD hearts stored in HTK exhibited a similar global myocardial function (A), left ventricular systolic (B), and right ventricular (C) contractility post-transplantation compared to controls (beating-heart donation). *p<0.05 vs. baseline. #p<0.05 vs. NRP. &p<0.05 between groups. D-F: Donor lung function (D) and inflammatory response (E, F) following NRP. Donor lungs showed preserved function following NRP despite a significant increase in production of IL-1b and IL-8 in the tissue. Control n=4, HTK n=5. NRP: normothermic regional perfusion. Tx: transplantation.
Estimating the increment in donor heart pool in an established multiorgan DCD transplant program

Juglans S Alvarez1, Roberto V P Ribeiro1, Frank Yu1, Mitchell B Adamson1, Claire Payne2, Andrew Healey2, Karen Hornby2, Fraser Rubens3, Mitesh V Badiwala1, Dave Nagpal4

1Division of Cardiovascular Surgery, Toronto General Hospital, University Health Network
2Trillium Gift of Life, Ontario’s Organ Procurement Organization, Toronto, ON
3Division of Cardiovascular Surgery, Ottawa heart Institute
4Division of Cardiovascular Surgery, London Health Science Center

Background: DCD heart transplantation is currently a reality with comparable early outcomes to standard transplants. Centers which perform DCD heart transplantation have reported an increase of up to 45% in their activities. We investigated the potential increase in donor heart pool if DCD heart transplantation were implemented in Ontario, Canada, where a well-established DCD program is in place for other solid organs.

Methods: We reviewed donor information from Ontario’s Organ Procurement Organization’s (OPO) database from 2014 to 2017 and identified those patients who met the following criteria to be considered for DCD heart transplantation: age<40y, distance to transplant center<90min, and functional warm ischemic time<30min. Donors who suffered a previous cardiac arrest of unknown reason were excluded.

Results: A total of 377 DCD donors had at least one organ used for transplant in this period and 60 met the criteria. If criteria were extended to include donors up to 50y, 119 would meet criteria. In this period, 326 heart transplants were performed in Ontario and 50 patients died on the heart waiting-list. Estimating a 75% utilization rate from donors up to 40y and 66% for those up to 50y, the expected increment would be 45/326(13.8%) and 78/326(24.1%), respectively.

Conclusions: Considering the DCD population’s clinical characteristics, OPO and transplant center logistics, we estimate an increment in the heart graft pool in the range of 15-25%. This are in line with what centers currently performing DCD heart transplantation have reported. Furthermore, this increase could significantly decrease patient mortality while on the waiting-list.
Echocardiographic evaluation of systolic ventricular function in a porcine model of DCD followed by static storage

Emanuela Paradiso1, Giulia Maria Ruggeri1, Roberto Ribeiro2, Juglans Alvarez3, Frank Yu2, Mitchell Adamson2, Joshua Qua Hiansen1, Mitesh Badiwala3, Massimiliano Meineri1,2

1 Toronto General Hospital, Department of Anesthesia and Pain management, 2 University of Toronto, Faculty of Medicine; 3 Toronto General Hospital, Department of Cardiovascular surgery

BACKGROUND

A critical shortage of organs limits heart transplant activity which can be increased by donation after circulatory death (DCD)[1]. Normothermic regional perfusion (NRP) is used within the donor to resuscitate and evaluate the DCD hearts [2] that are then transported with Organ Care System (OCS), the cost of which is still a limitation [3]. Using echocardiography we assessed systolic function to study the feasibility of conventional storage after NRP in a DCD porcine model.

METHODS

DCD was induced in 12 pigs after Ethic Board approval. One hour of NRP started after 15 minutes from asystole. Weaned hearts were conventionally stored, then transplanted. Epicardial echocardiography was used at baseline (BSL), after NRP and after transplant (HTx). We measured Ejection Fraction (EF), Fractional Area Change (FAC), Global longitudinal (GLS) and Circumferential Strain (GCS) for the left ventricle (LV), while FAC, S’ Tissue Doppler Imaging (TDI), tricuspid annular plane systolic excursion (TAPSE) and free wall longitudinal strain (FWLS) for the right.

RESULTS

10 hearts were successfully transplanted after a storage period of 147 min ± 9. A reduction in function was observed after Htx from BSL that was significant for TAPSE and FWLS. LV EF and RV FAC had a more pronounced drop after HTx from NRP that, however, was only of 10%; the same was observed for GLS.

CONCLUSIONS

This data suggest that DCD hearts after NRP can tolerate up to 2 hours of static storage. This strategy may represent a reasonable alternative to OCS.
Abstract session 2: LUNG AND HEART TRANSPLANTATION FROM DCD
REFERENCES


Retrieval practice or overall donor and recipient risk - What impacts on outcomes after DCD liver transplantation in UK?

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Background:
In the United Kingdom (UK), about 40% of liver grafts are obtained from donors after circulatory death (DCD). Retrieval teams are therefore widely experienced throughout the entire country. Here we analyze the impact of technical aspects of donor surgery among centres on outcomes after DCD liver transplantation.

Methods:
We retrospectively analyze all DCD liver transplantations performed at our centre between 2011 and 2016. Details of the donor retrieval technique, including timings of donor surgery, amount and type of in-situ donor and liver bench flush solution, retrieval injuries, donor and recipient risk factors were assessed. Outcome analysis compares engrafting of DCD livers being retrieved by different units in the UK focusing on graft loss and biliary complications.

Results:
Two-hundred-thirty-six DCD livers were included in this analysis. The median functional donor warm ischemia time was 17 min with a median UK-DCD-Risk-Score of 5 (low-risk) to 7 points (high-risk), comparing DCD livers retrieved by the 9 different centres. Majority used University of Wisconsin-solution for aortic flush with an amount of 5 liters. The median hepatectomy time ranged between 27 and 44 min, and centres with a significantly quicker hepatectomy (p=0.029) tend to induce more retrieval
injuries. The overall rate of liver injuries appeared relatively high with 27.1%. Among all included risk factors, the UK-DCD-Risk-Score remained the best predictor for overall graft loss in the multivariate analysis ($p<0.001$). Exclusively, in high-risk and futile donor-recipient combinations, the occurrence of liver injuries had impact on graft survival ($p=0.023$). More overall biliary complications ($p=0.021$) and ischemic cholangiopathy ($p=0.003$) were found in livers initially transplanted with a higher cumulative donor-recipient risk.

**Conclusion:**
The impact of centre-specific retrieval techniques on outcomes of DCD liver transplantation was minimal comparing different UK centres. However cumulative donor and recipient risk impacted on biliary complications and graft loss.
Outcomes of Liver Transplantation Utilizing Grafts of Donation after Circulatory Death (DCD): Single Centre Experience

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Background: Despite DCD liver grafts were reported to have more incidence of ischemic cholangiopathy (IC), the shortage of organs from deceased donors led to an increased utilization of DCD grafts in liver transplantation. The aim of our study was to retrospectively analyse the outcomes of DCD grafts liver transplantation in Edinburgh Transplant Centre. Our main focus was to explore recipients’ morbidity, graft loss and patient survival in 12 months post-transplantation. Methods: Over 12 years period (2005 – 2017), 99 recipients were transplanted with DCD liver grafts. Univariate, multivariate and survival analyses were done. Results: Our recipients mean age was 59.3 (21-73) and hepatocellular carcinoma (HCC) represented the most common primary indication for liver transplant (44.4%). The mean 1st warm ischemic time was 15.1mins and cold ischemic time was 7.2h. Primary graft non-function occurred in 6 recipients for which 4 recipients were re-transplanted. IC represented the most frequent recipient morbidity (21.2%), of which 52.4% required re-transplantation. Graft loss (12 months) occurred in 21.2% of our cohort and patient survival (12 months) was 87.9%. Kaplan-Meier survival analysis showed that primary graft non-function and IC are significantly associated with graft loss (12 months) (Log-rank P=0.05). Subgroup analysis of different variables was done with Cox regression and it showed that IC Hazard ratio was 3.21 (P=0.01). Conclusion: DCD grafts have very good survival outcomes, however this not without the costs of the high incidence of ischemic cholangiopathies. Nevertheless, DCD liver grafts would remain indispensable until normothermic machine perfusion technologies could replace them in the future.
Comparable Post-Reperfusion Blood loss and Transfusion Requirements during Transplantation of Donation after Circulatory Death and Donation after Brain Death Donor Livers

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Background

The specific effect of donation after circulatory death (DCD) liver grafts on hemostasis, blood loss, and transfusion requirements after graft reperfusion is not well known. Aim of this was to investigate whether transplantation of DCD livers is accompanied by an elevated risk of hyperfibrinolysis, increased blood loss and transfusion requirements upon graft reperfusion, compared to livers donated after brain death (DBD).

Methods

Data from a consecutive series of 513 primary adult liver transplant recipients was analyzed. Recipient, donor, intraoperative and postoperative variables from DCD and DBD liver recipients were compared. Additionally, blood samples from 36 patients from this cohort were collected and analyzed to compare the intraoperative fibrinolytic state. Continuous data were expressed as median [interquartile range].

Results

DCD livers were used in 121 of the 513 (24%) transplant procedures. There were no significant differences in post-reperfusion blood loss (1.0 L [0.5 – 2.3] vs. 1.2 L [0.5 – 2.2]; p = 0.795), RBC transfusion (1.1 U [0 - 3] vs. 2 U [0 - 4] U, p = 0.146), or FFP transfusion requirements (0 U [0 - 1.5] vs. 0 U [0 - 2.3]; p = 0.341) in DCD compared to DBD recipients. Plasma fibrinolytic potential and plasmin-antiplasmin complexes were comparable for the two groups.

Conclusion

Liver transplantation with a DCD liver does not result in higher intraoperative blood loss or more transfusion requirements, compared to DBD liver transplantation. In accordance to this, no evidence for increased hyperfibrinolysis upon reperfusion of DCD compared to DBD liver grafts was found.
Title: A matched case-control study of the behaviour of type 2 and type 3 Donation after Cardiac Death (DCD) livers

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Background: Despite of normothermic regional perfusion (NRP), type 2 DCD liver grafts require strict inclusion criteria for maintaining acceptable post-transplant survival. Normothermic machine perfusion (NMP) could improve the use of these organs.

Methods: The evolution during NMP of 5 type 2 DCD livers discarded for transplantation was compared with that of ten matched type 3 DCD grafts submitted to NMP without NRP in the COPE-WP2 study, with age and BMI as matching variables. The hemodynamic, metabolic and biochemical evolution were analyzed for both groups.

Results: Donor risk index was 2.40 ± 0.37 for the type 2 and 2.17 ± 0.41 for the type 3 group, p 0.313. Arterial and portal flow and pH evolution curves during the NMP procedures were similar between the two groups. Bile production during NMP started earlier and reached higher flows in the type 2 cases. No differences were found in the transaminase level in the NMP. Both groups showed similar improvement of the lactate levels, although the type 2 cases started with initial higher levels (mean of 51.37 mg/dL at 1 hour and 32.97 at 6 hours in the type 2 and of 29.55 at one hour and 11.95 at 6 hours in the type 3).

Conclusion: Type 2 and type 3 DCD showed a similar evolution during the NMP. With the combination of NRP and NMP, the bile production started earlier and registered higher flows in the type 2 group.
LIVER DONATION AND TRANSPLANTATION WITH CONTROLLED DONORS AFTER CIRCULATORY DEATH AND THE INFLUENCE OF PORTABLE NRP AT HOSPITAL CLINIC DE BARCELONA


Introduction: Controlled donation after circulatory death (cDCD) represents an expansion source for liver transplantation, where normothermic Regional Preservation (nRP) has demonstrated to be an adequate preservation methodology.

Material and methods: A retrospective and descriptive study considered all possible cDCD liver donors (cDCDLD) managed at Hospital Clinic de Barcelona (HCB), analyzing their assessment, recovery and transplantation from 2014 to 2017. nRP was the donor preservation tool in all cases. General cDCD inclusion criteria embrace kidney donors of ≤85 years old, liver donors of ≤65 years old, absence of absolute contraindications for donation and a total warm ischemia time (tWIT) <120 minutes and a functional warm ischemia time (fWIT) <30min for liver and 90min for kidneys. Donor characteristics, transplant rates, liver function after transplantation and patient and graft survival are described.

Results: From January 2014 to December 2017, 118 possible liver donors coming from H. Clínic de Barcelona (n=55), other reference centers (n=15) or liver offers from the Catalan transplant office (OCATT) (n=46) were evaluated. 2 cases were considered as no potential cDCDLD, and in 86 cases liver was previously discarded, being age (n=31), liver enzymes disturbances (n=23) and comorbidity (n=11) the main causes of no liver procurement. 30 cDCD livers were recovered (25,8%), with a transplantation rate of 60% (n=18). Poor liver perfusion (n=8) and liver enzymes disturbances during nRP (n=2) were the major causes of liver rejection. 10 out of 18 liver transplants were procured in a different hospital from the transplant center with a portable nRP.

Median age and BMI were 50±7,6 years and 26,5±3,8 Kg/m2, and 76,7% were men. The most common cause of death was encephalic anoxia after myocardial infarction (46,6%), with a median ICU stay of 10,3±12,7 days. Most of WLST were done in the operating room (66,6%). Median tWIT was 18,8min. and median fWIT was 14,9min. Pre-mortem cannulation and heparinization was performed in 93,3% of cases. nRP time was 99,4±35,8 minutes.

The average cold ischemic time was 438,6±100,6 minutes. Recipients, with average age of 56,6±7,6 years and 83,3% males, had a MELD score of 12,4±5,9. Patient and graft survival were 88,9 and 83,3% with a median follow-up of 18 months. Retransplantation rate was 11,1%.

Conclusions: cDCD are a valid source of livers with comparable results to DBD ones. Portable nRP has allowed increasing more than double the number of cDCD livers for transplantation.
Recipients of DCD liver grafts treated with NRP display lower postoperative morbidity and mortality compared to standard DCD liver graft recipients in the first year post transplant

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Background: Normothermic regional perfusion (NRP) was developed to attenuate the harmful effects of prolonged warm ischemia and subsequent cold storage caused during the process of donation after circulatory death (DCD) procurement. Herein we analyze the impact of NRP on postoperative morbidity and mortality following NRP-DCD liver transplantation (LT) compared to standard DCD LT during the first postoperative year.

Material & Methods: Medical records from patients transplanted with a standard DCD or NRP treated liver graft between January 2013 and June 2017 at the Edinburgh Transplant Centre were retrospectively analyzed.

Results: In the defined period 55 patients were transplanted with a standard DCD liver graft and 18 patients with a NRP treated DCD liver graft. There were no significant differences concerning recipient or donor characteristics between the two groups. When looking at early graft function, NRP liver graft recipients had significantly lower peak ALT levels during the first week compared to standard DCD recipients (503.28IU/L vs 1671.68 IU/L). While 4 patients (7.27%) in the standard DCD group suffered from PNF, none of the NRP recipients developed this complication. During the primary hospital stay standard DCD recipients had more Clavien-Dindo complications >grade III (43.64% vs 27.78%), required more urgent re-transplantation (9.09% vs 0.00%) and had higher mortality (Clavien-Dindo V in 3.64% vs 0.00%) than patients in the NRP group. Regarding all complications within the first year post LT standard DCD recipients were readmitted more frequently and required a higher number of interventions such as liver biopsies (38.18% vs 16.67%), MRCP (40.00% vs 16.67%), CT-scans (60.00% vs 33.33%), re-laparotomy (36.36% vs 11.11%) and re-transplantation (16.36% vs 0.00%) compared to NRP-DCD recipients.

Conclusion: NRP has a positive impact on postoperative morbidity and mortality of DCD liver graft recipients. NRP can aid in expansion of DCD utilization in light of the increasing shortage of donor organs.
Hypoxia and apoptosis: role in development of ischaemic cholangiopathy in DCD liver transplantation

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Background
During the Agonal phase in donation after circulatory death (DCD), from the reduction of SpO2 to the asystole, livers undergo a state of hypoxia, preceding the ischemic phase. A significant increase in hypoxia inducible factor (HIF)-1α and cell apoptosis was reported after reperfusion of livers subjected to ischemia and reperfusion. Ischemic cholangiopathy and AKI are common complications of DCD, whose pathogenic hypothesis recognizes the role of ischemia-reperfusion injury (IR). The aim is to evaluate the role of the hypoxic phase on biliary damage in liver transplantation.

Methods
Histological analysis (hematoxylin-eosin) and immunohistochemistry (apoptosis-TUNEL and proliferation-PCNA) of 62 bile duct samples (28 DCD, 34 DBD) collected before biliary anastomosis, after hepatic reperfusion.

Results
A significant increase in necrosis of the bile duct wall, damage of the peribiliary plexus and damage to the peribiliary glands (PBG) were observed in DCD. The combined presence of these alterations, defined as severe histological damage (SHD), is significantly more common in DCD and is associated with an increased degree of apoptosis at the level of deep PBGs. Five patients develop ischemic cholangiopathy (4 DCD - 1 DBD). DCDs that develop ischemic cholangiopathy have a longer hypoxia time.

Conclusion
The damage from IR is more severe in DCD, as evidenced at the histological level. A role of the hypoxic phase has been hypothesized, involving the release of HIFs, which should induce changes at the cellular level, such as the increase of apoptosis.

This study was supported by the ESOT Grant 2017.
Factors Associated with the Development of Chronic Kidney Disease after Liver Transplantation

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Background

Renal dysfunction is a common complication after liver transplantation. The increased use of DCD livers has been associated with postoperative acute kidney injury (AKI). However, the relation between DCD grafts and development of chronic kidney disease (CKD) is less well defined. Our aim was therefore to assess risk factors, including graft type and AKI, with impact on development of CKD after liver transplantation.

Methods

We included all patients, who underwent primary liver-only transplantation between 2007-2015 for end-stage liver disease. Patients with a survival <3 months after transplantation were excluded. eGFR was calculated using the MDRD-4 formula and renal function was divided into 3 groups: no CKD (eGFR ≥60), mild CKD (eGFR 30-59) and severe CKD (eGFR <30). Postoperative AKI was defined according to the KDIGO criteria.

Results

A total of 961 patients were included (72% DBD and 28% DCD grafts). During the study period, 43% of the patients developed CKD. Importantly, severe CKD and end-stage renal disease occurred in only 3% and 1%, respectively. DCD recipients had a more pronounced drop in kidney function in the first postoperative week (eGFR 42 vs. 50; P<0.001) (Figure 1A), but they recovered quickly and long-term kidney function was comparable with those receiving a DBD graft (41 vs. 44%; P=0.478) . Only recipients requiring renal replacement therapy (RRT) in the immediate post-transplant period had significant impaired long-term kidney function (Figure 1B). This was confirmed in a multivariable COX-regression analysis for development of CKD (AKI requiring RRT: HR 1.6, 95%CI 1.2-2.1, P=0.002).

Conclusion

Recipients with severe postoperative AKI requiring RRT are less likely to experience a full recovery in long-term kidney function. Interestingly, CKD did not occur more frequently after implantation of DCD grafts. Overall, it is essential to identify risk factors and treat recipients at risk for severe postoperative AKI to preserve long-term kidney function.
Abstract session 3: THE DCD LIVER

Figure 1A: long-term kidney function in DBD & DCD liver transplantation

Figure 1B: Post-transplant AKI & long-term kidney function

Overall CKD:
No AKI 40% & AKI without RRT 41% vs. AKI with RRT 55%
P = 0.001
RENAL RESISTANCE TREND DURING HYPOTHERMIC MACHINE PERFUSION IS MORE PREDICTIVE OF POST-OPERATIVE OUTCOME THAN BIOPSY SCORE: PRELIMINARY EXPERIENCE IN 35 CONSECUTIVE KIDNEY TRANSPLANTATIONS

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Background: hypothermic machine perfusion (HPM) grants a better postoperative outcome in transplantation of organs procured from extended criteria donors (ECDs) and donors after cardiac death (DCDs). So far, the only available parameter for outcome prediction concerning those organs is pre-transplant biopsy score. The aim of this study is to evaluate whether renal resistance (RR) trend during HPM may be used as a predictive marker for post-transplantation outcome.

Methods: from December 2015 to present, HMP has been systematically applied to all organs from ECDs and DCDs. All grafts underwent pre-transplantation biopsy evaluation using Karpinski’s histological score. Only organs that reached RR value \( \leq 1.0 \) within 3 hours of perfusion were transplanted. Single (SKT) or double kidney transplantations (DKT) were performed accordingly to biopsy score results.

Results: 65 HMPs have been performed (58 from ECDs and 7 from DCDs/ECMO donors). 15 kidneys were insufficiently reconditioned (RR>1) and were therefore discarded. 49 kidneys were transplanted, divided between 21 SKT and 14 DKT. Overall primary non function(PNF) and delayed graft function(DGF) rate were 2.9% and 17.1%, respectively. DGF were more common in kidneys from DCDs (67%vs.7%; p=0.004). Biopsy score did not correlate with PNF/DGF rate (p=0.870) and post-operative creatinine trend (p=0.796). Recipients of kidneys that reached RR\( \leq 1.0 \) within 1 hour of HMP had a lower PNF/DGF rate (11%vs.44%;p=0.033) and faster serum creatinine decrease (POD10 creatinine: 1.79 mg/dL vs. 4.33 mg/dL; p=0.019).

Conclusions: RR trend is more predictive of post-transplantation outcome than biopsy score. Hence, RR trend should be taken into account in the pre-transplantation evaluation of the organs.
Brief O₂ uploading at the onset of continuous hypothermic machine perfusion results in improved early renal graft function compared to continuous or end ischemic O₂ supply: preliminary results of a porcine ischemia-reperfusion auto-transplant model.

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Background

The aim of this study was to evaluate the impact of different perfusate oxygen concentrations and timing during continuous hypothermic machine perfusion (HMP) on early graft function in a porcine kidney ischemia-reperfusion auto-transplant model.

Methods

The left kidney of ±40 kg landrace pig was exposed to 30 minutes of warm ischemia by vascular clamping and randomized out to one of 7 studied preservation strategies: 1) 22h static cold storage (SCS), 2) 22h (no active oxygen supply) HMP, 3) 22h oxygenated HMP (HMPO₂low)(pO₂=220-240mmHg), 4) 20h SCS + 2h HMPO₂low, 5) 22h HMPO₂high(pO₂=700-800mmHg), 6) 2h HMPO₂high+20hHMP, and 7) 20h HMP + 2h HMPO₂high. The LifePort Kidney Transporter® was used for all machine perfusion strategies. The kidney was auto-transplanted in a right orthotopic position.

Results

The overall effect of each treatment strategy of 40 autotransplants on early graft function expressed as AUC of the serum creatinine of 40 autotransplants from day 1 until day 13 post-transplantation demonstrated that 2h HMPO₂high+20h HMP was comparable with 22h HMPO₂high or 22h HMPO₂low, but significantly lower than non-active oxygenated HMP (p<0.0001), 20h HMP+2hHMPO₂high (p=0.0288) and end ischemic HMPO₂ after SCS (p<0.0001). The serum creatinine was significantly lower at day 1, 2, and 3 after transplantation in the 2h HMPO₂high+20h HMP group, the 22h HMPO₂low or 22h HMPO₂high group but not in the 20h HMP+2h HMPO₂high group compared to 22h non-active oxygenated HMP.
Conclusion

Brief $O_2$ uploading at the start might be the best and most convenient oxygenation strategy for continuous HMP to improve early graft function.
Production of Physiologically Relevant Quantities of Hemostatic Proteins During Normothermic Machine Perfusion of Human Livers

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Background: Ex situ normothermic machine perfusion provides the opportunity to assess graft function and viability, particularly of sub-optimally functioning donor livers, prior to transplantation. During ex-situ NMP, donor livers usually resume normal metabolic and synthetic functions; such as hemostatic protein production. However, the quantities of these proteins produced are currently unknown.

Methods: Six donor livers [5 livers from donation after circulatory death (DCD) and 1 liver derived from donation after brain death (DBD)] declined for transplantation underwent 6 hours of end-ischemic NMP using a heparinized plasma-free perfusion fluid. Concentrations of key pro-hemostatic (Factors II, V, VII and X, fibrinogen and VWF), anti-coagulant (protein C and antithrombin III) and fibrinolytic (plasminogen and tissue-plasminogen activator) proteins were measured in perfusion fluid at regular intervals during NMP and compared with a plasma-based reference solution.

Results: Pro-coagulants showed an increase of 9-57% of the levels measured in the plasma reference solution whereas anticoagulant and fibrinolytic protein levels amounted to 41-71% and 18-116%, respectively.

Conclusion: This study demonstrates the capability of donor livers perfused with a plasma-free perfusion fluid to produce substantial amounts of pro-coagulant, anti-coagulant and fibrinolytic proteins during a relatively short period of NMP. These results are influential in determining appropriate anticoagulation protocols to avoid activation of hemostasis throughout NMP.
Novel technique for echocardiographic evaluation of ventricular function during ex vivo heart perfusion

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Background

Functional evaluation of donor hearts before transplantation is crucial for successful outcome [1]. Ex vivo heart perfusion (EVHP) was developed to decrease cold ischemia time and to allow metabolic and functional assessment [2]. Organ care system (OCS), the commercially available platform, provides only metabolic assessment [3]. Echocardiography is the main rapidly available and non-invasive instrument for cardiac evaluation [4]. We developed a 3D printed setup to perform epicardial echocardiography using a transesophageal echocardiography probe (TEE) during an experimental “working mode” assessment on EVHP circuit.

Methods

The components of the setup were designed using Autodesk Fusion 360 software, then exported as a stereolithography file and 3D printed on Taz Lulzbot 5th generation 3D printers using polylactic acid thermoplastic. The system is composed of an assembled basin with support for cannulas and a track for a TEE probe. A spacer was fixed on the TEE probe to improve epicardial contact. The basin is filled with normal saline and an organ bag is placed over it. After Ethics Board approval, 5 Yorkshire pig hearts were harvested and mounted on the system. After 3 hours of perfusion, hearts were loaded and echocardiographic evaluation was performed with a Siemens SC 2000™.

Results

Images of left (LV) and right ventricles (RV) were obtained. Images were of good quality and were comparable to standard transthoracic and transesophageal views which allowed for measurements of functional cardiac assessment.

Conclusions

Epicardial echocardiography was feasible with our system. Echocardiography may be included as diagnostic modality during working mode EVHP.
References


TPM training programs in DCD: a 20-year experience

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Background
Transplant Procurement Management (TPM) has been promoting a better understanding of DCD programs through its specialized trainings in the last two decades. The aim of the study is to analyze the specialized training in DCD for an efficient development.

Methods
TPM provides regularly face-to-face workshops and blended training on DCD controlled and uncontrolled either in the framework of international courses, university training, congresses and conferences or upon special request. Data show the programs, number of participants and the level of satisfaction.

Results
Since 1999, 1627 participants attended the training in the advanced TPM courses in Barcelona, Spain: 911 participants from 85 countries in 18 editions in English, and 716 participants from 23 countries in 19 editions in Spanish. Sessions were evaluated with 4.35/5 marks in the English editions and 4.49/5 in the Spanish ones.
Since 2013, 131 participants from 41 countries were trained in the Master D&T by the TPM-University of Barcelona. Since 2017 it includes a specific online course on uncontrolled and controlled DCD. Evaluations marks were positive with 4.6/5.

Conclusion
TPM delivers efficient specialized training programs on DCD with positive effects for healthcare workers on knowledge, technical skills and professional competence development.
Liver transplantation with cDCD grafts -The Norwegian experience.

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Background:
In order to meet the increasing demand for donor organs the concept of donation after circulatory death (DCD) has been reintroduced in Norway. First as a pilot study comprising 8 donors were performed in 2014 and 2015, followed by the use of DCD as an institutional practice. We here report the current Norwegian experience with liver transplantation utilizing DCD donors.

Methods:
The donation process followed the Norwegian protocol for controlled DCD (cDCD). After acceptance from next of kin, life support was withdrawn and cardiac arrest observed. After a five minute “no-touch” period, extracorporeal membrane oxygenation for post mortem regional normo-thermic regional perfusion by an ECMO circuit was established. Data from all liver transplant recipients receiving cDCD livers in Oslo were analyzed.

Results:
From November 2015 to May 2017, 8 patients underwent liver transplantation with donor livers procured by cDCD in Norway. Procedural characteristics are given in Table 1. The indications for liver transplantation in the 7 patients were: 1) Steatohepatitis, 2) HCV, 3) PSC, 4) Post resection liver failure after resection for HCC, 5) Re-transplantation after graft failure of an ABO incompatible graft in an acute on chronic patient, 6) Non-resectable colorectal metastases, 7) NASH with HCC and 8) Cryptogenic cirrhosis.

Three of the patients were in the intensive care unit with MELD of 33, 40 and 40 respectively pre-transplantation. One choledocho-duodenostomy were performed, one choledocho-jejunostomy and the rest were choledochal duct to duct anastomoses. There were no cases of delayed graft function or graft loss. Two patients underwent procedures for the biliary complications: One with leakage from the cystic duct which was successfully handled endoscopically by stenting. In the other patient, a suspected stricture on MRI led to an ERCP procedure which however did not confirm signs of biliary stenosis. A stent was placed with no effect on liver function. There was one instance of hepatic artery stenosis, which was managed with endovascular technique. Two patients were re-operated several times for wound-closure and wound infection. All in all, there were 2 patients with Clavien Diodo Grade IIIb, 1 patient with grade IVa (a patient which continued dialysis after liver transplantation) 7 patients have reached 1 year of follow-up, 1 patient has reached 6 months. Of these two patients have recurrence of primary disease (PSC and steatohepatitis). All patients had normalized liver function at last follow-up.

Conclusion:
The results after liver transplantation using cDCD liver are excellent. The rate of complications seems to be within the same range as when using conventional DBD grafts. Implementation of cDCD could provide a valuable source of donor livers.
Table 1 Procedural characteristics:

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<th>Characteristic</th>
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<td>fWIT minutes</td>
<td>20.5 (15-96)</td>
</tr>
<tr>
<td>WIT minutes</td>
<td>25 (13-41)</td>
</tr>
<tr>
<td>CIT hours</td>
<td>7.14 (2.51-9.55)</td>
</tr>
</tbody>
</table>

Values are median (range)

fWIT – functional warm ischemic time, (time for mean blood pressure below 50 mmHG in more than 2 minutes), WIT – warm ischemia time, CIT: cold ischemic time

Table 2 Liver recipients  
cDCD (n=7)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, years</td>
<td>59 (35-68)</td>
</tr>
<tr>
<td>Male sex, n (%)</td>
<td>75%</td>
</tr>
<tr>
<td>DGF, n (%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Graft loss, n (%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Maximum ALAT after Ltx (U/L):</td>
<td>991 (290-3533)</td>
</tr>
<tr>
<td>ALAT at 3 weeks post Ltx (U/L):</td>
<td>51 (15-86)</td>
</tr>
<tr>
<td>Allograft rejections n</td>
<td>1</td>
</tr>
</tbody>
</table>

Values are Median (range) unless otherwise specified

cDCD; controlled donation after circulatory death, DGF; delayed graft function,
First Russian successful liver and kidneys transplantation from “out of hospital” cardiac death donor with mechanical cardio-pulmonary resuscitation (mCPR) followed by ECMO

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\textbf{Background.} The use of the mCPR in case of out of hospital cardiac arrest (OHCA) followed by ECMO procedure in the case of failed resuscitation for the keeping organs dead person alive could be promising additional way for expanding donor pool.

\textbf{Methods.} Starting from 2017, the protocol for 19 patients with OHCA on mCPR was established. Only in one case was suitable as a potential donor with irreversible CA (ICA). Donor: M.,35. Arrival time to hospital on mCPR(Lucas\textsuperscript{TM}) was 66min (after 33min - declared the death). The portable perfusion device (PPS) (by TransBioTech.Ltd) was used for ECMO-OP by transplant coordinator (femoral access, without thoracic balloons, time 355min, flow 3.2L/min, pressure 90mmHg). There were 2 KTx and LTx performed into the three recipients: 2-on hemodialysis (HD) (women, man) and one with chronic liver disease (man, MELD-24). The average age of the patients was 47.67(0.75) years.

\textbf{Results.} After KTx was observed DGF in both cases, the diuresis recovered at 21(7HD) and 27(9HD) days. The average levels of serum creatinine were 0.147(0.013) and 0.167(0.013) mmol/L in 2 month after Tx. Recipient with LTx was discharged from hospital after 1 month (AST–18U/l, ALT–47U/l, Bilirubin-28,1mmol/L).

\textbf{Conclusions.} Routinely use of PPS in clinical practice in emergency rooms and ICUs could relevantly expand the donors’ pool. The performing of femoral access ethically should be approved for primarily using the ECMO resuscitation of patient after mCPR. Seems ethically acceptable the use ECMO–OP after failed ECMO resuscitation, in case of ICA.

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Challenges of DCD in India
Avnish Kumar Seth, Director Fortis Organ Retrieval & Transplant, India

Background: Majority of 0.8 PMP donors in India in 2017 were DBD. There is an urgent need to increase donor pool.

Methods: National DCD workshop was conducted in India in 2016 and feasibility and challenges discussed. DCD activity in the country was tracked in 2016-17.

Results: Transplantation of Human Organs Act 2011 provides legislation for DCD in India. However, only 21 of 36 States and Union Territories adopted the law till date, limiting the implementation of organ donation activities. National Organ & Tissue Transplant Organization was established only in 2016 and lack of robust database remains a challenge. Tertiary health in India is largely paid care with 90% of transplants in private hospitals. There is lack of quality trauma care with limited on-site resuscitation, air evacuation and ventilators. Opt-in system does not allow for DCD Maastricht Types I and II. Even though ‘passive euthanasia’ has been legalized in 2018, process of withdrawal of life support remains cumbersome. In 2016-17, there were 12 DCD donations (Type IV in 9, Type V in 2 and Type III in 1) leading to transplantation of 19 kidneys and 2 livers.

Conclusion: Difficulties Could Deny DCD other than Type IV in India.
Analyzing the Situation of Organ Donation in Central South of China

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* Corresponding author

**Background:** Organ donation after citizen death (DCD) in China has developed gradually since the government promotes it powerfully since 2012, but the donation rate in China is still much lower than that of developed countries. How to promote the development of organ donation after citizen death (DCD) becomes the key issue of organ transplantation.

**Method:** From March 2010 to November 2017, the transplant center of 3rd Xiangya Hospital of Central South universities had approached 1928 potential organ donors, in which 382 of them had successful completed donation. We divide them into two groups: agree group and rejected group. We collected the general information of DCD donors. We also collected the main reasons for agree or refusal of immediate family members. We analyzed the data by SPSS.
Result: In spite of 198 potential donors whose relatives had agreed donation but failed to complete donation since disease mutations and sudden death, there are 1348 objects in object group. 48.6% of them reject donation because of Chinese traditional views (n=655). Among the agree group (n=382), 306 of them are male and 64.39% of them are between 19 to 49 year old (n=246). Mostly of family agree to donate because their consider organ donation is the continuation of their family members own life and thought it is meaningful to help others (n= 215, 56.28%).

Conclusion: The organ donors in China were mainly male. Farmers or urban migrant workers with instable jobs, low education level, and simple family structure composed the largest part of organ donation in China. Traditional views and social factors have played significant roles in organ donation decision of immediate family members.
HYPOTHERMIC MACHINE PERFUSION AS AN ALTERNATIVE TO BIOPSY ASSESSMENT IN TRANSPLANTATION OF KIDNEYS DONATED AFTER CARDIOCIRCULATORY DEATH: A PILOT STUDY

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². Transplant Medicine, San Raffaele Scientific Institute, Milan, Italy

Background: Transplantation of kidneys from donation after cardiocirculatory death (DCD) donors is an ever-increasing reality, but histological assessment is poorly reliable in the evaluation of graft suitability and has several drawbacks. The aim of this study is to verify if real-time renal resistance (RR) measurement during hypothermic machine perfusion (HMP) can be used as an alternative parameter to evaluate the quality of grafts from DCD and ECMO donors.

Methods: From January 2015 to present, HMP has been systematically applied to all organs from DCD and ECMO donors. All grafts underwent pre-implantation biopsy histological assessment. Single (SKT) or double kidney transplantations (DKT) were performed according to biopsy score. Kidneys were considered suitable for transplantation if RR reached value ≤1.0 within 3 hours of perfusion.

Results: 30 kidneys (15 DCD, 15 ECMO) were used to perform 26 transplantations (22 SKT, 4 DKT). Based on RR trend, all grafts were considered suitable for transplantation within 1 hour of perfusion. Biopsy confirmed this result in all cases, and median score was 3 (range:0-7). SKT kidneys had lower starting RR than DKT ones (1.88vs.2.88;p=0.037), but identical final RR (0.58vs.0.57;p=0.757). DKT recipients had faster postoperative creatinine reduction than SKT ones, but similar value after 30 days from transplantation (1.42vs.1.15 mg/dL;p=0.198). No differences were found between DCD and ECMO grafts.

Conclusions: HMP can be an alternative to histological biopsy assessment for evaluation of transplant suitability of DCD and ECMO kidneys. If acceptability threshold is reached, SKT can be performed in all cases. ECMO donors should be considered like DCD donors.
Donation after circulatory death (DCD) and kidney transplantation: the NITp experience

Antonino Cannavò¹, Serena M Passamonti¹, Valentina Trunzo¹, Daniele Vincenti¹, Antonio Longobardi¹, Giuseppe Rossini¹, Sergio Vesconi², Giuseppe Piccolo², Massimo Cardillo¹, on the behalf of North Italian Transplant program (NITp) centers

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² Coordinamento Regionale Trapianti, Regione Lombardia

INTRODUCTION: Because of the shortfall between the number of patients on the waitlist and the available grafts, strategies to expand the donor pool have been encouraged. Experience from centers with high volume donation after circulatory death (DCD) programs demonstrate that DCD can have an equivalent graft survival.

AIM: The aim of this study was to report the experience on DCD in the North Italy Transplant program (NITp) in kidney transplantation.

METHODS: All consecutive DCDs referred to the NITp from January 2017 to April 30, 2018 were included. Descriptive analyses were performed.

RESULTS: Among 34 DCDs with a mean age of 52.9 (±12.5 SD), 31 (91%) were male. Donors died for acute myocardial infarction (71%), ischemic stroke (12%), trauma (9%), acute respiratory failure (5%) and massive central bleeding (3%). All donors had a documented cardiac arrest. Twenty-one were standard donors. Seventeen were DCD type II and 17 type III, according to Maastricht criteria. Ex-vivo machine perfusion (MP) was applied to 40 kidneys. Eight (24%) DCDs type III were not used after histological evaluation (score>5) and 19 (56%) DCDs type II for ischemic injuries. Nineteen (56%) kidneys from DCD type III and 2 (6%) from DCD type II were transplanted (p <0.05). Thirty-three were single and 2 were dual kidney transplantation. One graft had a primary non function and 6 a delayed function. No difference was observed between DCD types.

Conclusions: DCD type III had a higher success rate in kidney harvesting, but with no differences in graft function compared to DCD type II.
Monocentric experience of kidney transplant from DCD donors

Authors full names and affiliations

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Background

Kidney transplantation is the treatment of choice in patients affected by end-stage-renal-disease. The gap between demand for and availability of donated organs is still remarkable; donation from after cardiac death (DCD) donors represent a huge source to increase the rate of disposable organs. Many studies have demonstrated that, despite the higher incidence of delayed graft function, short and medium-term transplant outcomes are comparable between DCD and DBD donors.

Methods

Monocentric retrospective observational study on kidney transplants from DCD donors between 01/2016 and 02/2018.

Results

12 patients received kidney transplantation from DCD donor, 11 single kidney and 1 double kidney transplant. All organs where from controlled donors (Class II Maastricht) and underwent kidney biopsy for allocation showing mean Karpinsky score of 2.3 (SD +/-1.6). Mean cold ischemia time has been 10.5 hours (SD +/-3.5). No primary non function has been registered. Delayed graft function has been observed in 3 patients (25%), significantly lower than described in literature (49%). No graft loss has been observed in the first year, 2 patients (same donor) died with functioning graft due to infectious complications.

High risk of CMV infection has been observed (41%) during pre-emptive antiviral-free strategy.

Mean serum creatinine values at discharge and 12 months after transplant were not stastically different from those of DBD donors.

Conclusion

Kidney transplant from DCD donor shown graft outcomes comparable to those from DBD donors at 12 months, confirming current literature. A significantly lower incidence of DGF has been observed as an high risk of CMV infection.
SIMILAR 1- YEAR RENAL FUNCTION IN KIDNEY GRAFTS FROM CONTROLLED DONATION AFTER CIRCULATORY DEATH AND DONATION AFTER BRAIN DEATH

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\textsuperscript{5}Department of Cardiothoracic Surgery, Oslo University Hospital
\textsuperscript{6}School of Pharmacy, University of Oslo, Oslo, Norway
Background

Recent years we have experienced increased waiting lists for kidney transplantation with a transplant activity restricted to donation after brain death (DBD) and living donation. As donation after circulatory death may increase the number of organs for transplantation, a protocol for controlled donation after circulatory death (cDCD) utilizing abdominal normothermic regional perfusion has been introduced in Norway. We hereby present the results from our first cDCD kidney transplantations.

Methods

Kidney function was evaluated by comparing measured glomerular filtration rates (mGFR; plasma iohexol clearance) at eight weeks and one year after transplantation between cDCD grafts (n=22) and DBD grafts (n=163). Recipient and grafts were matched for age and era. Mann-Whitney U test was used for comparison and two-tailed p-values < 0.05 were considered statistically significant.

Results

There were no significant difference in mGFR between recipients of cDCD and DBD kidney grafts, neither at week 8 nor one year after transplantation; 64 vs 59 mL/min/L/1.73m² at 8 weeks (p=0.98) and 71 vs 61 mL/min/L/1.73 m² at one year post-transplant (p=0.32), respectively. The one-year graft survival was 95% in both groups (p=0.98). The rate of delayed graft function was 18% in the cDCD group compared to 5% in the DBD group (p=0.22)

Conclusion
The first 22 cDCD kidney transplantations showed clinical function in line with our results from DBD transplantation at both eight weeks and one year after transplantation. This has encouraged us to continue to address the shortage of organs for transplantation by utilizing cDCD kidneys.

Table 1. Demographic data

<table>
<thead>
<tr>
<th></th>
<th>cDCD (n=22)</th>
<th>DBD (n=163)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, years</td>
<td>55 (33–71)</td>
<td>52 (2–80)</td>
<td>0.59</td>
</tr>
<tr>
<td>Male sex, n (%)</td>
<td>16 (73 %)</td>
<td>111 (68 %)</td>
<td>&lt;0.005</td>
</tr>
<tr>
<td>CIT, minutes</td>
<td>479 (174–1161)</td>
<td>767 (233–1685)</td>
<td>&lt;0.005</td>
</tr>
<tr>
<td>DGF, n (%)</td>
<td>4 (18%)</td>
<td>8 (5%)</td>
<td>0.22</td>
</tr>
<tr>
<td>Measured GFR week 8 post- transplant (mL/min/1.73m2)</td>
<td>64 (18.78)</td>
<td>59 (31,106)</td>
<td>0.98</td>
</tr>
<tr>
<td>Measured GFR week 52 post- transplant (mL/min/1.73m2)</td>
<td>71 (48–76)</td>
<td>61 (37–112)</td>
<td>0.32</td>
</tr>
<tr>
<td>Graft loss at 12 months, n (%)</td>
<td>1 (5 %)</td>
<td>8 (5 %)</td>
<td>0.98</td>
</tr>
</tbody>
</table>

Values are Median (range) unless otherwise specified

DBD; donation after brain death, cDCD; controlled donation after circulatory death, CIT; cold ischemic time, DGT; delayed graft function, GFR; glomerular filtration rate (iohexol plasma clearance)
Comparison of renal transplantation outcomes from donation after cardiac death donors and living relative donors

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Abstract

Background: The organ shortage is a severe problem over the years in China especially that brain death criteria is not widely accepted. The implement and promotion of renal transplantation from donation after cardiac death (DCD) donors relives the shortage of transplanted organs, and benefits patients with end-stage renal diseases. Although acceptable outcomes have been reported in kidney transplantation from DCD in world, little is known about kidney transplantation from DCD compared with living relative donors (LRD) in China. The objective of this study is to compare the outcome of kidney transplantation using DCD donors with the outcome using LRD.

Methods: Recipients from DCD donors and LRD (>18 years and <65 years) transplanted in third Xiangya Hospital of Central South University between March 2010 and December 2015 were included in this study.
335 patients were transplanted with kidneys from DCD donors and 294 patients received grafts from LRD.

**Results:** Compared with LRD grafts, grafts from DCD donors were associated with higher percentage of primary non-function (2.38 versus 0.3%, P<0.01), delayed graft function (21.5 versus 1.7%, P<0.001) and serious infection (13.4 versus 6.5%, P<0.01). Estimated glomerular filtration rate did not differ between groups (55±16 versus 58±22 mL/min at 1 year and 57±14 versus 59±22 mL/min at 5 years, respectively). After correction for confounding variables, the risk of graft failure was higher in the DCD group [hazard ratio 3.440 (95% confidence interval (CI) 1.380–5.650; P<0.01]. Patient survival, however, was similar between groups [hazard ratio 1.614 (95% CI 0.764–2.692; P = 0.241)].

**Conclusions:** Although DCD renal transplantation is associated with a higher risk of DGF, PNF, serious infection and graft failure than LRD, the transplantation with DCD kidneys could achieve favorable short and medium-term clinical outcome in terms of graft survival and function. We therefore conclude that DCD kidneys may represent another potential method to safely expand the donor pool.
Ante mortem measures, no-touch period and posthumous harm during organ procurement: what should be allowed, and when?

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In the process of harvesting organs from deceased donors, it is widely accepted that the procedure itself must not be the cause of death, and consequently the donor must be declared dead before the removal of vital organs. The so called Dead Donor Rule (DDR) still remains a recognized ethical and legal boundary.

In organ donation after Declaration of Brain Death (DBD), once the criteria for Brain Death (BD) are accepted as a scientifically solid threshold of brain damage and the diagnosis of BD a well settled practice, the DDR is never put at risk.

On the contrary, in donation after Circulatory Declaration of Death (DCD), and particularly in the controlled setting (cDCD), a wide range of different practices is observed, and the cogency and the coherence of the DDR are often challenged.

Moreover, in cDCD donation, what should be allowed during the dying process and before death declaration is still debated.

In both DBD and DCD donation, every intervention that follows the declaration of death doesn't have to comply with ethical and legal restraints, as a corpse is not a bearer of any of the interests of a living person.

We argue that in the last part of the dying process (the agonal period and the asystolic “no-touch” time) and in the post-mortem harvesting process, the same respect should be accorded to the dying and to the dead donor. The posthumous harm, although not a physical distress nor a conscious experience, may represent a “dignity harm” in no way different from the potential harm that precedes the declaration of death, especially in the presence of the family.

Every intervention of the process (declaration of futility of further life support, evaluation of donor viability, ante-mortem measures, donor maintenance, ex-vivo organ perfusion and organ harvesting) has the same ethical justifications: respecting the donor/surrogate will, respecting the donor dignity, maximizing the quality of the procured organs.
Controlled Kidney and Liver Donation after Circulatory Death (cDCD): a single centre experience.

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Since 2015, when the first Italian Maastricht III DCD procurement occurred, a protocol for controlled DCD (cDCD) has been implemented at our institution. Between August 2015 and May 2018, 11 potential donors were considered for controlled donation; 8 of them became real cDCD donors; 14 kidney and 4 livers were eventually harvested.

In Italy, a period of normothermic Regional Perfusion (nRP) is necessary in order to restore splanchnic perfusion and to improve the viability of organs damaged surging a prolonged functional Warm Ischemia Time (fWIT). Routine management includes ante-mortem percutaneous placement of small-gauge introducer sheaths in the femoral vessels and positioning of the intra-aortic balloon.

The mean donor age was 62 years; 2 of them were older than 68 years. The mean times from the withdrawal of life support (WLST) to asystole and the mean functional warm ischemia time (fWIT) were 17 and 40 minutes, respectively. Mean cannulation time was 11,5 minutes in the first four cases, decreasing to 3,5 minutes in the last four cases. Donors were transferred from the ICU to the theatre after 206 minutes of nRP on average.

The nRP allows time for repeated monitoring of creatinine, liver enzymes and lactate clearance before organ retrieval. Our data demonstrate that training in the cDCD procedure allows the reduction of the fWIT by decreasing the cannulation time.
Reperfusion activates AP-1 and heat shock response in donor kidney parenchyma after warm ischemia

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⁶School of Systems Biology, George Mason University, Fairfax, VA, United States

Background: Utilization of kidneys from extended criteria donors lead to an increase in average Warm Ischemia Time (WIT), which is associated with ischemia-reperfusion injury (IRI) aggravation. Kidney resuscitation by extracorporeal perfusion in situ allows up to 60 minutes of asystole after the cardiac death. Molecular studies of kidney grafts from donors with critically expanded WIT are warranted.

Methods: Transcriptomes of two kidneys from two different donors were profiled after 35-45 minutes of WIT and after 120 minutes of normothermic perfusion and compared.

Results: Baseline gene expression patterns in ischemic grafts display substantial intrinsic differences. IRI does not lead to substantial change in overall transcription landscape but activates a highly connected protein network with hubs centered on Jun/Fos/ATF transcription factors and HSP1A/HSPA5 heat shock proteins. This response is regulated by positive feedback. IRI networks are enriched in soluble proteins and biofluids assayable substances, thus, indicating feasibility of its longitudinal, minimally invasive assessment in vivo.

Conclusion: Mapping of IRI related molecules in ischemic and reperfused kidneys provides a rationale for organ conditioning during ex vivo normothermic machine perfusion. Studies of natural diversity of the transcriptional landscapes in presumably normal, transplantation-suitable human organs are warranted. As transplantation outcomes may be influenced by summarily outputs of the networks formed both by protective and by injury-promoting molecules, larger transcriptome-based studies of donors organs should be performed, and the resultant networks correlated with short and long-term clinical outcomes.

Acknowledgements: Supported by the Russian Science Foundation, Project No. 17-18-01444, and the Scientific State Program 6.9899.2017/8.9, Russia
Viability of livers from controlled DCD after long warm ischemia time: is the donor age really relevant?

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In order to address the increasing discrepancy between the number of liver transplant (LT) candidates and the availability of liver grafts, the utilization of DCD donors for LT has increased in the last decade. Compared to DBD, an increased rate of biliary complications, ischemic cholangiopathy, graft loss and mortality in transplant recipients from DCD donors has been reported, and for this reason, multiple reports have suggested that donor age ≥ 60 years can be associated with increased risk. However, LT from elderly donors after brain death (DBD) shows good results and age doesn’t represent per se a contraindication.

In this context, we analysed the liver characteristics of the controlled DCD (cDCD) performed in our centre with donors age ≥ 60. The 5 donors’ mean age was 66.5 ± 5.9 years. We collected, in all of them, liver enzymes, lactate clearance during normothermic regional perfusion (nRP), length of functional Warm Ischemia Time (fWIT) and liver biopsy. In only one of the donors we found an aminotransferase peak, a reduced clearance of lactate and histologic finding of ischemic damage at liver biopsy.

Taking into account all the different variables involved in liver viability and long-term outcome (pre-existing liver damage, length of functional ischemia and pure ischemia, efficacy of the nRP), is the age of the donor really relevant? Or is it just a small piece of the puzzle? Can we push the limits?
Histological Characterisation of Severe Post-ischemic Cholangiopathy After Liver Transplantation

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Post-transplant cholangiopathy, characterized by diffuse non-anastomotic biliary strictures, either with or without intraductal casts, is a major cause of graft failure after transplantation. Histological injury of peribiliary glands (PBG) and peribiliary vascular plexus at the time of transplantation has been identified as a risk factor for the development of post-transplant cholangiopathy. PBG represent a stem cell compartment and provide a second-line repair mechanism to restore biliary epithelium after severe cell loss. It is unknown whether end-stage post-transplant cholangiopathy is characterized by PBG damage. We, therefore, aimed to determine histological abnormalities in donor livers retransplanted for post-transplant cholangiopathy and to compare this with livers retransplanted for hepatic artery thrombosis (HAT) or non-biliary causes of graft failure.

Donor bile ducts of patients that required retransplantation for post-transplant cholangiopathy (n=18), HAT (n=13), or a non-biliary cause of graft failure (n=11) were evaluated by immunohistochemistry and immunofluorescence.

Bile ducts of livers with post-transplant cholangiopathy were characterized by severe damage of PBG with loss of mature-type PBG cells, reduced density of peri-PBG vessels, mucinous metaplasia of PBG cells, and fibrosis. Similar findings of PBG damage and loss of vessels was found in livers with HAT, but not in livers with non-biliary causes of graft failure. Histological signs of PBG damage correlated with serum markers of biliary injury and cholestasis.

This study provides evidence for a pivotal role of PBG injury in the pathogenesis of post-transplant cholangiopathy. Preservation of PBG vitality should be a target for future strategies aiming to reduce the incidence of post-transplant cholangiopathy.
CONTROLLED DONATION AFTER CIRCULATORY DEATH USING NORMOTHERMIC REGIONAL PERFUSION – THE NORWEGIAN EXPERIENCE

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Abstract:

Background: Donation after circulatory death (DCD) can increase the pool of available organs for transplantation. This study evaluates the first Norwegian series using abdominal normo-thermic regional perfusion (NRP) in a controlled DCD (cDCD) protocol.

Methods: Patients aged 16 -70 years in coma with documented devastating brain injury, whom would most likely attain cardiac arrest within 90 minutes after extubation, were eligible. With the acceptance from the next of kin and their wish for organ donation, Heparin® was given at withdrawal of life-sustaining treatment (WLST) and cardiac arrest observed.
After a 5 minute “no-touch” period, extracorporeal membrane oxygenation cannula were introduced by Seldinger’s technique to establish NRP. Cerebral and cardiac reperfusion was prevented by an aortic occlusion catheter. Data is presented as median (range)

**Results:** Eighteen cDCD were performed from 2014-2017. Median age was 52 (18-66), 13 male, traumatic brain injury (n=6), cerebrovascular accident (n=4), hypoxic-anoxic brain injury (n=7). Patients were in ICU for a median of 4 days (2-19). Circulation ceased median 12 (5-83) minutes after WLST. Functional warm ischemic time was 19 (13-40) minutes. NRP was applied for 91 (54-221) minutes, with a median drop in lactate values of 4,4 (-6,6-11,2) mmol/L. Organs from 2 donors were not used (preoperative cancer/misplaced aortic catheter). Thirty-two kidneys, eight livers and islets from one pancreas were transplanted.

**Conclusion:** Excellent NRP procedural, content next of kin and ICU staff has encouraged us to continue this line of work. The protocol is now under assessment before a national implementation.
**Donation after circulatory death (DCD) and liver transplantation: the NITp experience**

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**INTRODUCTION:** Because of the shortfall between the number of patients on the waitlist and the available grafts, strategies to expand the donor pool have been encouraged. Experience from centers with high volume donation after circulatory death (DCD) programs demonstrate that DCD can have an equivalent graft survival.

**AIM:** The aim of this study was to report the experience on DCD in the North Italy Transplant program (NITp) in liver transplantation.

**METHODS:** All consecutive DCDs referred to the NITp from January 2017 to April 30, 2018 were included. Descriptive analyses were performed.

**RESULTS:** Among 34 DCDs (mean age of 52.9 (±12.5 SD)), 31 (91%) were male. Donors died for acute myocardial infarction (71%), ischemic stroke (12%), trauma (9%), acute respiratory failure (5%) and massive central bleeding (3%). All donors had a documented cardiac arrest. Twenty-one were standard donors. Seventeen were DCD type II and 17 DCD type III, according to Maastricht criteria. Sixteen DCDs were not used, 13 for acute multiorgan failure and 3 for opposition. Ex-vivo machine perfusion (MP) was applied to 15 livers. Out of 18 used livers, 2 (11%) experienced a primary non function (PNF). About PNF, no differences were found in donor age, sex, DCD type, MP use and waitlist. PNF livers seems to have had a longer period of ischemic injury compared to those with a normal graft function (mean 64 vs 16 minutes, p 0.058).

**CONCLUSION:** DCD grafts may improve access to liver transplantation without difference in graft survival between type II and type III.
Red blood cell distribution width as a predictor for mortality in renal transplant recipients with acute respiratory distress syndrome by pneumonia

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Abstract

Background: There are no effective biomarkers to predict the prognosis of acute respiratory distress syndrome (ARDS) after renal transplantation with high mortality. Red blood cell distribution width (RDW) has been reported to be relevant to adverse prognosis in many diseases. Hence, we proposed this study to investigate whether RDW could be useful for predicting 50-day mortality in renal transplant recipients with ARDS by pneumonia.

Methods: Patients with ARDS after renal transplantation in the third Xiangya Hospital of Central South University from August 2007 to June 2016 were retrospectively analyzed. RDW was categorized into two groups: ≤14.0% and >14.0%. Univariate and multivariate Cox proportional hazards regression analyses were performed to test the risk factors for 50-day mortality.
Results: A total of 106 patients were included, and the overall 50-day mortality was 43.4%. The mortalities of RDW ≤14.0% group and RDW >14.0% group were 18.6% and 60.3% respectively, which showed significant difference (P < 0.001). In Cox proportional hazards analysis, RDW > 14.0% was an independent factor associated with higher 50-day mortality (hazard ratio, 2.85; 95% CI, 1.25-6.48).

Conclusions: Elevated RDW was meaningfully related to the severity and 50-day mortality in renal transplant recipients with ARDS. Therefore, RDW could be a promising independent prognostic predictor in patients with ARDS after renal transplantation.
The Evolving Process of DCD in the United States
Francis Delmonico

The process of Donation after Circulatory Death (DCD) has evolved in the United States with the expansion of the donor registry. More than 140 million are registered throughout the United States to be an organ donor at the time of their demise. In 2017, the US recorded the largest annual number of DCD (1883), constituting 18.3% of more than 10,000 organ donors. The percentage of DCD has doubled in the last decade.

Virtually all DCD in the United States is done as a controlled event following a patient’s death declared on the basis of circulatory criteria, and after withdrawal of life-sustaining therapies. DCD patients are comatose having suffered a devastating brain injury (tumor, trauma or stroke) but whose clinical condition does not fulfill the criteria of brain death--- the brainstem function remains intact as evident by the capacity to take a spontaneous breath.

Authorization for DCD follows permission for deceased donation. The law governing permission for deceased donation (the Uniform Anatomical Gift Act) mandates the determination of death but does not distinguish how death is declared. Subsequent authorization is derived by the patient’s own previously made decision as indicated in the donor registry, or by an advanced directive or can be obtained by the patient’s authorized surrogate.

The classic separation of an organ donation discussion and a discussion of prognosis regarding the clinical condition of coma and the futility of treatment has now been modified because of the donor registry. The timing of the organ donation discussion with family can be conducted as the prognosis is conveyed to the family that further treatment is futile and a decision has been made to discontinue futile life-sustaining therapy. Thus, the donor registry has changed greatly the process of DCD in the United States.
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