From preservation to transformation in renal transplantation

FOS_09_3 ONE-YEAR OUTCOME OF HMP(O2)-PERFUSED KIDNEYS AFTER THE IMPLEMENTATION OF A NATIONAL MACHINE PERFUSION SERVICE

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Background: In October 2022, a national hypothermic machine perfusion (HMP) service was implemented for all kidneys from expanded criteria donors (ECD) and kidneys donated after circulatory death (DCD) procured and transplanted in Belgium. The aim of this study is to evaluate the functional one-year outcome of these kidneys continuously perfused with HMP.

Methods: A retrospective analysis was performed on 242 HMP-perfused kidney transplantations (DBD+DCD) performed between 1/10/2022 and 30/09/2023 of which 49 from ECD (defined as a DBD donor between 50-60yrs old with 2/3 following criteria (arterial hypertension, serum creatinine>1.5mg/dl and death due to cerebrovascular accident) or a donor> 60yrs) and 193 from DCD donors. The LifePort Kidney Transporter (?Organ Recovery Systems) was used for all MP procedures. Active oxygenation realized by preceding bubble O_2 of the perfusate and continuous surface O_2 during HMP was applied to all DCD>50yrs and in study context in 14 DCD≤50yrs[5]. Donor demographics and functional outcome were analyzed.

Results: The 1-year functional outcome according to donor type is illustrated in Table 1.

Donor type	All (ECD +DCD)	DBD ECD	DCD	DCD≤50y	DCD>50yrs
Type of kidney preservation (HMP, $HMPO_2$)	HMP(O2) (n=242)	HMP (n=49)	HMP (n=193)	HMP(O2)[5] (n=77)	$HMP(O_2)$ (n=116)
Delayed graft function, %	14.35	9.14	16.67	9.46	19.64
Mean eGFR @1y, ml/ min/1.73m²	54.25	52.03	54.69	61.10	49.73
Organ rejection @1y, %	10.05	2.33	12.82	8.96	14.00
Death-censored graft survival @1y, %	96.28	100	94.34	97.40	93.97
Patient survival @1y, %	98.34	95.91	98.96	100	98.28

The reasons for graft loss (13/242) were primary nonfunction (n=1), rejection (n=1), donor-transmitted infection (n=1), graft infection (n=1), arterial thrombosis (n=1), venous thrombosis (n=2), unknown (n=2) and patient's death (n=4).

Conclusions: Functional outcome of HMP-preserved kidneys after the introduction of a national HMP program for all ECD and DCD kidneys is excellent and reassures transplant teams in their decision-making process when such higher-risk kidneys are offered for transplantation.

FOS_09_4 RESCUING DONOR KIDNEYS FOR TRANSPLANTATION AT A DEDICATED NORMOTHERMIC PERFUSION CENTER

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Background: In 2024, 31,677 deceased donor kidneys were recovered in the US with the intent to transplant, however 9,266 (29%) were discarded. Rescue of these organs may be facilitated using normothermic machine perfusion (NMP), which can prolong out of body time and provide additional viability assessment. While NMP has been increasingly used internationally, barriers to adoption of NMP in the US include limited availability, staffing and facility resource limitations, geographic distances between donor and recipient hospitals, blood shortage, and nationwide reliance on hypothermic machine perfusion (HMP).

Methods: To overcome obstacles to US-based NMP, the first regional NMP center for discarded kidneys was established in West Lafayette, Indiana. Organized as an independent public benefit company, this center was constructed to provide NMP as a regional hub-and-spoke service to transplant centers and Organ Procurement Organizations (OPOs), offering functional assessment of unused donor kidneys (Table 1). An acellular, human serum albumin- based perfusate was chosen and validated pre-clinically to avoid the need for blood. Additionally, an extended second cold ischemic time was validated during the pre-clinical testing to mimic transportation from the central NMP center to the accepting transplant hospital. Central IRB approval was granted in March 2024, and the first kidney was transplanted after NMP on April 20th, 2024 (clinicaltrials.gov: NCT06263023).

Results: To date, 68 unused kidneys were transported to the central NMP center. 59 (87%) of these kidneys were transplanted successfully after NMP by 9 transplant centers. Median initial cold ischemic time (CIT) prior to NMP was 20.3 hours (range 11.5- 30 hrs). Median transport CIT (after NMP and prior to transplant) was 15 hours (range 9- 33 hrs) with median total out of body time (donor cross clamp to recipient reperfusion) of 38.5 hours (range 27.2- 60 hrs). Characteristics of donor kidneys transplanted after NMP can be found in Table 2.

Conclusions: Acellular NMP is feasible when performed by a centralized hub and reduces kidney discard by providing objective viability assessment. Moreover, NMP allows for extended preservation times up to 60 hours, enabling improved logistical planning and broader sharing of deceased donor kidneys.

Table 1. COMPARISON BETWEEN KIDNEY ASSESSMENT METHODS

Renal Biomarker	Ice (4°C)	HMP (4°C)	NMP (35°C)
Renal Flow Rate		✓	✓
Renal Pressure		✓	✓
Renal Resistance		✓	✓
Perfusate pO_2/ pCO_2/ pH			✓
Urine pO_2			✓
TCO_2/ HCO_3^-/ Base Excess			✓
Perfusate Na^+/ K^+/ Cl^-			✓
Urine Na^+/ K^+/ Cl^-			✓
Lactate/ Glucose			✓
AST (marker of mitochondrial death)			✓
Oxygen Consumption			✓
Hosgood Transplant Suitability Score			✓

Table 2. CHARACTERISTICS OF 59 HTP KIDNEYS RESCUED BY NMP

Donor Age (years)	Median: 53	Range: 15- 69
# DCD Donors	36 (57%)	With NRP: 8 (14%)
# Donors with HTN	35 (59%)	
Glomerular Sclerosis %	Median: 4	Range: 0- 71
Peak sCr (mg/dL)	Median: 1.61	Range: 0.7- 11.09
KDPI %	Median: 64	Range: 24- 98
1st CIT pre-NMP	Median: 20.2 hrs	Range: 11.5- 30 hrs
2nd CIT post-NMP	Median: 15 hrs	Range: 9- 33 hrs
Total Out Of Body Time	Median: 38.5 hrs	Range: 27.2- 60 hrs
Renal Resistance pre-NMP	Median: 0.24	Range: 0.08- 1.03
Renal Resistance post-NMP	Median: 0.14	Range: 0.05- 0.30