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Initial Experience with Thoracoabdominal Normothermic Regional Perfusion Controlled Donation After Cardiac Death Liver Transplants

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Purpose: Controlled donation after cardiac death (cDCD) liver transplant is increasingly being performed to address the organ shortage faced by waitlisted candidates but is associated with higher risk of primary non-function and ischemic cholangiopathy. With the recent North American interest in cDCD heart transplant procured following restoration of circulating oxygenated blood and arrest of ischemic damage via thoracoabdominal normothermic regional perfusion (NRP), cDCD liver allografts following NRP are coincidently being increasingly offered with the potential of improving outcomes. We describe our initial experience with NRP cDCD liver transplants.

Methods: Liver transplant recipient, donor and organ procurement data were retrospectively reviewed at our center between January 2021 and November 2022. Continuous data presented as median (IQR) was analyzed using Mann-Whitney U test while categorical data was analyzed using Chi-Square test.

Results: We performed 4 NRP cDCD liver transplants, 2 of which were simultaneous liver-kidney, in recipients with median native MELD-Na of 22. None had portal vein thrombosis and 3 had previous abdominal surgery. Following a donor warm ischemia time between 20 - 31 minutes, NRP was ran for 45 - 93 minutes prior to organ recovery. In comparison with 15 contemporaneous cDCD liver transplant recipients, NRP cDCD liver transplant recipients experienced less early allograft dysfunction defined as one of total bilirubin >10 mg/dL on day 7, INR >1.6 on day 7 and ALT or AST >2000 IU/mL within 7 days (1 (25%) vs. 13 (87%), p=0.01) and

less biliary strictures (0 (0%) vs. 9 (60%), p=0.02). No NRP cDCD liver transplant recipient suffered from post-reperfusion syndrome and none developed ischemic cholangiopathy or hepatic artery thrombosis. NRP cDCD liver transplant patient and graft survival is 100% with a median follow-up of 8 months with no significant difference compared to the cDCD group (Table 1).

Conclusions: Our initial experience with NRP cDCD liver transplant confirms its feasibility and safety with a reduced incidence of early allograft dysfunction and biliary strictures compared to cDCD.

Table 1. Exploratory comparisons of recipient, donor and organ procurement characteristics as well as recipient outcomes between cDCD and NRP cDCD

	cDCD	NRP cDCD	p
n	15	4	
Recipient characteristics			
Age (years)	58 (41 – 64)	60 (52 – 67)	0.48
Sex (M:F)	12:3	4:0	0.33
Race			
Caucasian	3	2	0.03
Hispanic	11	0	
African American	1	1	
Asian	0	1	
Diagnosis			
Alcoholic cirrhosis	5	1	0.25
Non-alcoholic steatohepatitis	3	0	
Hepatocellular carcinoma	5	2	
Hepatitis C cirrhosis	0	1	
Autoimmune hepatitis	2	0	
Body mass index (kg/m^2)	26.3 (23.8 – 31.8)	24.2 (23.6 – 26.1)	0.32
Native MELD-Na	22 (17 – 29)	22 (11 – 24)	0.55
Portal vein thrombosis	4	0	0.25
Previous abdominal surgery	5	3	0.13
Hemodialysis pre-transplant	6	0	0.13
Simultaneous liver-kidney transplant	4	2	0.37
Anastomosis warm ischemic time (minutes)	35 (33 – 39)	39 (34 – 41)	0.34
Estimated blood loss (mL)	1200 (750 – 2000)	1025 (288 – 1875)	0.48
Packed red blood cell transfusion (units)	6 (3 – 14)	6 (2 – 9)	0.73
Fresh frozen plasma transfusion (units)	7 (6 – 13)	6 (3 – 11)	0.73
Cryoprecipitate transfusion (units)	2 (2 – 3)	2 (1 – 3)	0.35
Platelets transfusion (units)	2 (2 – 3)	2 (1 – 3)	0.71
Donor and organ procurement characteristics			
Age	44 (38 – 49)	35 (23 – 43)	0.09
Sex (M:F)	7:8	4:0	0.06
Warm ischemic time (minutes)	19 (17 – 24)	23 (21 – 29)	0.16
Cold ischemic time (minutes)	430 (399 – 473)	455 (412 – 464)	1.00
Recipient outcomes			
Post-reperfusion syndrome	3	0	0.33
Early allograft dysfunction	13	1	0.01
Acute kidney injury	9	3	0.58
Hemodialysis post-transplant	6	1	0.58
Biliary stricture	9	0	0.02
Ischemic cholangiopathy	2	0	0.42
Hepatic artery thrombosis	1	0	0.58
Intensive care unit stay (days)	1 (1 – 2)	2 (1 – 5)	0.55
Hospital length of stay (days)	7 (5 – 10)	6 (4 – 15)	0.59
Reoperation within 30 days	2	2	0.11
Readmission 0 to 30 days	1	1	0.32
Graft loss	2	0	0.44
Mortality	1	0	0.60