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Effect of Donor Body Mass Index on the Outcome of Donation After Cardiac Death Kidneys: How Big is Too Big?

L.X. Jin, S.C. Pitt, M.B. Doyle, C. Klein, S. Shenoy, J.A. Lowell, W.C. Chapman, and J.R. Wellen

ABSTRACT

Introduction. Morbid obesity (MO) has become an epidemic in the United Sates and is associated with adverse effects on health. The purpose of this study was to examine the effects of MO on the short-term outcomes of kidneys transplanted from donation after cardiac death (DCD) donors.

Patients and Methods. Using a prospectively collected database, we reviewed 467 kidney transplantations performed at a single center between January 2008 and June 2011 to identify 67 recipients who received transplants from 40 DCD donors. The outcomes of 14 MO DCD donor kidneys were compared with 53 non-MO DCD grafts. MO was defined as a body mass index $\geq$35. Mean patient follow-up was 16 months.

Results. The MO and non-MO DCD donor groups were similar with respect to donor and recipient age, gender, race, cause of death and renal disease, time from withdrawal of life support to organ perfusion, mean human leukocyte antigen (HLA) mismatch, and overall recipient survival. Organs from MO DCD donors also had comparable rates of delayed graft function (21.4% vs 20.0%; P = not significant [NS]). At 1 year post-transplantation, a small but statistically insignificant difference was observed in the graft survival rates of MO and non-MO donors (87% vs. 96%; P = NS). One MO kidney had primary nonfunction.

Conclusions. These data demonstrate that kidneys procured from MO DCD donors have equivalent short-term outcomes compared with non-MO grafts and should continue to be used. Further investigation is needed to examine the effect of MO on long-term renal allograft survival.

OBESITY is a worldwide epidemic that leads to severe comorbidities and end-stage organ damage. In 2011, all 50 states in the United States had an obesity prevalence of greater than 20%. Currently, 78 million US adults are obese [1]. Trends among renal transplant donors and recipients have mirrored that of the general population [1]. In various operations, reports frequently indicate that obesity is associated with increased operative time, blood loss, and complications [2–5]. Furthermore, in renal transplantation, the impact of recipient obesity has been extensively studied, and data show that overall transplantation outcomes in obese patients are inferior to those in nonobese patients [6–11]. Multiple studies have documented the relationship between high recipient body mass index (BMI) and increased rates of wound infection and delayed graft function (DGF) in kidney transplant recipients [6,8–10]. Recipient BMI also has been shown to be an independent predictor of outcomes after renal transplantation with morbid obesity (MO) being associated with worse allograft survival [6,9,12]. However, the impact of donor obesity on

From the Washington University School of Medicine (L.X.J.), the Department of Surgery (S.C.P., M.B.D., S.S., J.A.L., W.C.C., J.R.W.), Section of Transplant Surgery, Washington University School of Medicine, and the Department of Medicine (C.K.), Division of Nephrology, Washington University School of Medicine, St. Louis, Missouri, USA.

Linda X. Jin and Susan C. Pitt contributed equally to the article and share first authorship.

Address reprint requests to Jason R. Wellen, MD, Washington University School of Medicine, Department of Surgery, Section of Abdominal Transplantation, 660 S. Euclid Avenue, Campus Box 8109, St. Louis, MO 63110-1093. E-mail: wellenj@wudosis.wustl.edu

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transplant outcomes is less clearly understood, particularly in the donation after cardiac death (DCD) donor pool.

While some studies have shown that increased live donor BMI is associated with DGF [7,9,12,13], primary nonfunction (PNF) [13], acute rejection [14], and increased length of stay [9,12], no studies have shown an association with graft survival. In living donors, concern exists over intrinsic kidney disease and long-term function of the remaining kidney, leading many transplantation centers to limit the living donor BMI that they will accept to <35 [15]. However, few investigations have addressed the impact of donor obesity in DCD donors [12,16]. Due to donor size and the fat content of both the abdominal wall and intra-abdominal cavity, obesity in DCD donors carries the theoretical risk of a more difficult dissection and, thus, prolonged anastomosis time from incision to aortic cannulation, which may affect short- and long-term graft function. Therefore, the purpose of this study was to investigate the potential effect of MO in DCD donors on kidney recipient outcomes.

MATERIALS AND METHODS

Study Population

This retrospective review of a single-center experience included prospectively collected data on all kidney transplant recipients at our institution between January 1, 2008 and June 30, 2011. Data were analyzed from all patients undergoing renal-only transplantation using DCD kidneys. This study was approved by the Washington University in St. Louis Institutional Review Board.

Outcomes

Outcomes of renal allografts from MO DCD donors were compared with those from non-MO DCD donors. The primary endpoint was death-censored graft survival. MO was defined as a BMI ≥35 in concordance with the World Health Organization (WHO). Graft survival was assessed at routine postoperative visits according to our institutional protocol (available by request), and was defined as the time from transplantation to allograft loss, return to dialysis, or retransplantation, whichever occurred first. DGF, PNF, and patient survival were examined as secondary endpoints. DGF was defined according to the United Network for Organ Sharing (UNOS) data collection convention as the need for at least 1 dialysis session within the first week after transplantation. Renal allografts with DGF that failed to resolve by postoperative day 90 were considered to have PNF. These grafts had function inadequate to prevent the need for dialysis in the absence of rejection or surgical etiologies of graft failure for 3 months post-transplantation. Endpoints were assessed according to donor factors at the time of transplantation.

Statistical Analysis

Statistical analysis was performed using STATA software, version 10 (StataCorp, College Station, Tex, United States). Unadjusted death-censored graft survival was analyzed using the Kaplan-Meier method with the log-rank test to assess statistical significance. Categorical variables were compared by using the chi-square and Fisher exact test and presented as a percentage of the group from which they were derived. Continuous variables were expressed as the mean ± standard deviation (SD), and compared using Student *t* test. All *P* values were 2-sided, with a value of <.05 considered statistically significant.

RESULTS

From January 1, 2008 to June 30, 2011, a total of 467 kidney transplant recipients were evaluated for inclusion in the study cohort. Of these patients, 67 (14.3%) recipients received kidneys from 40 unique DCD donors. Fourteen recipients (20.8%) received transplant allografts from MO DCD donors. Less than one fifth of the DCD donors were MO (n = 7/40; 18%). Baseline donor and recipient demographic variables stratified by MO status are shown in Table 1. The mean BMI for non-MO donors was 27 ± 5 kg/m^2, whereas the mean BMI for MO donors was 40 ± 4 kg/m^2. No statistically significant differences existed in donor age, gender, or race between MO and non-MO donors. The anastomosis time or time from withdrawal of life support to organ perfusion by aortic cannulation was also not significant between the 2 groups. Similar to the demographics of the donors, recipient characteristics did not vary significantly between those receiving donation from a MO or a non-MO DCD donor (Table 1). No significant

Table 1. Donor, Recipient, and Transplant Characteristics

Variables	Non-MO n = 53	MO n = 14	*P*
Donor			
BMI (kg/m^2)	26.7 ± 5.3	40.0 ± 3.9	–
Age (y)	32.8 ± 13	36.0 ± 11	.45
Female gender (%)	14 (26)	4 (29)	1.00
Caucasian (%)	47 (89)	10 (71)	.21
Extubation to cannulation time (min)	27.7 ± 11	23.7 ± 4	.10
Cause of death, n (%)			.23
Anoxia	22 (42)	8 (56)	
CNS tumor	2 (4)	0 (0)	
CVA	6 (11)	4 (29)	
Head trauma	19 (36)	2 (15)	
Other	4 (8)	0 (0)	
Recipient			
Age	57.7 ± 12	52.0 ± 12	.17
Female gender (%)	20 (40)	4 (29)	.54
Diagnosis (%)			
Diabetes	5 (9)	5 (36)	.03
Hypertension	15 (28)	5 (36)	.74
PCKD	5 (9)	0 (0)	.57
Glomerulonephritis	8 (15)	2 (7)	1.00
Other	8 (15)	1 (14)	.67
HLA mismatches			.20
2	0 (0%)	1 (8%)	
3	6 (14%)	0 (0%)	
4	10 (23%)	2 (17%)	
5	12 (28%)	3 (25%)	
6	15 (34%)	6 (50%)	
Anastomosis time (min)	37 ± 12	36 ± 13	.78
Cold ischemia time (h)	13.3 ± 5.2	16.4 ± 2.6	.04

Abbreviations: CNS, central nervous system; CVA, cerebral vascular accident; PCKD, polycystic kidney disease.
Note: Data are presented as mean ± SD.