



Diabetes With or Without Hypertension Does Not Affect Graft Survival and All-cause Mortality After Liver Transplant: A Propensity Score Matching Analysis

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ABSTRACT

Background. Many studies have reported the negative influence of diabetes and hypertension on morbidity and mortality in the general population. In liver transplantation (LT) recipients, prevalence of nonalcoholic fatty liver disease and metabolic syndrome is increasing. Hence, concerns over the negative influence of metabolic syndrome, including diabetes and hypertension, are growing. However, there have been few studies about the outcomes of LT recipients with diabetes with/without hypertension. We aimed to evaluate the impact of diabetes with/without hypertension on the outcomes of LT.

Methods. Between May 2010 and October 2015, 814 LT recipients (median age, 51 [46–55] years; median MELD score, 13 [9–18]), without overt cardiovascular disease were retrospectively evaluated. To rigorously adjust for clinically confounding factors, a 1:2 propensity score matching analysis was performed. Kaplan-Meier survival curves and Cox proportional hazard regression analysis were performed to examine the association between diabetes with/without hypertension and all-cause mortality or graft survival rate.

Results. There were 77 (9.5%) graft failures and 71 (8.7%) deaths during a median follow-up of 2.4 years. After 1:2 matching of 173 (21.3%) diabetic patients, no significant differences were evident in graft survival rate (log-rank test, $P = .46$; and hazard ratio [HR], 1.06; 95% confidence interval [CI], 0.55–2.06; $P = .865$) and all-cause mortality (log-rank test, $P = .59$; and HR, 1.06; 95% CI, 0.55–2.06; $P = .727$). Separate 1:2 matching was applied to a subgroup of 43 (5.3%) patients with diabetes and hypertension. This matching also showed no difference in graft survival rate (log-rank test, $P = .45$; and HR, 1.35; 95% CI, 0.43–4.27; $P = .613$) and all-cause mortality (log-rank test, $P = .25$; and HR, 1.87; 95% CI, 0.54–6.50; $P = .325$).

Conclusion. Diabetes with/without hypertension does not have an impact on graft survival rate or all-cause mortality in LT recipients.

END-STAGE LIVER DISEASE (ESLD) increases the risk for diabetes due to several pathophysiologic reasons, leading to metabolic disturbance [1–3]. Furthermore, as the proportion of nonalcoholic fatty liver disease (NAFLD) has gradually increased among ESLD patients being considered for liver transplantation (LT) [4,5], interest in the influence of metabolic syndrome, including diabetes and hypertension, on the outcome of LT recipients has also grown [6–8].

Diabetes is a risk factor for morbidity or mortality [9–13] and is associated with outcomes in various operations including LT [14–19]. However, the effects of

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pretransplant diabetes and hypertension on perioperative morbidity and mortality after LT are not yet clearly defined. It still remains controversial whether diabetes affects outcome in LT recipients [20–28], and little is known about the effect on outcome in LT recipients with both diabetes and hypertension. Therefore, we evaluated the impact of pretransplant diabetes, with or without hypertension, on the outcomes of LT recipients, including graft failure and all-cause mortality.

MATERIALS AND METHODS

Patients and Clinical Data

We retrospectively analyzed prospective data that had been collected for 839 consecutive adult (≥ 18 years old) patients who

underwent LT at Asan Medical Center between May 2010 and October 2015. The exclusion criterion was incomplete data ($n = 25$). A total of 814 LT recipients were included in the final analysis. After approval from the institutional review board, we collected and analyzed demographic, laboratory, and clinical data from the electronic medical records. Massive transfusion was defined as >5 packed red blood cell transfusions.

Outcome and Follow-up

The primary outcome was the impact of diabetes on the graft survival and all-cause mortality of LT. The secondary outcomes were graft survival and all-cause mortality between patients with and without both diabetes and hypertension. All patients were followed up for at least 1 to 4 years.

Table 1. Preoperative Characteristics and Intraoperative Variables of Patients With and Without Diabetes Before and After Propensity Score Matching

Variables	Unmatched			Matched		
	No Diabetes (n = 641)	Diabetes (n = 173)	P Value	No Diabetes (n = 345)	Diabetes (n = 173)	P Value
Age (years)	51 (45–55)	52 (49–56)	.001	53 (49–57)	52 (49–56)	.46
Male	484 (75.5%)	144 (83.2%)	.041	288 (83.5%)	144 (83.2%)	1
Body mass index (kg/m ²)	23.9 (21.7–26.5)	23.5 (21.2–25.9)	.118	23.8 \pm 3.0	23.7 \pm 3.5	.842
Hypertension	51 (8.0%)	43 (24.9%)	<.001	31 (9.0%)	43 (24.9%)	<.001
Varix bleeding history	141 (22.0%)	51 (29.5%)	.05	90 (26.1%)	51 (29.5%)	.475
MELD score	14 (9–23)	12 (10–18)	.026	13 (9–18)	12 (10–18)	1
Child-Turcotte-Pugh score	8 (6–11)	8 (6–10)	.036	8 (6–10)	8 (6–10)	.793
Child-Turcotte-Pugh class			.039			.895
A	179 (27.9%)	56 (32.4%)		107 (31.0%)	56 (32.4%)	
B	217 (33.9%)	69 (39.9%)		145 (42.0%)	69 (39.9%)	
C	245 (38.2%)	48 (27.8%)		93 (27.0%)	48 (27.7%)	
Medication						
Diuretics	165 (25.7%)	62 (35.8%)	.011	97 (28.1%)	62 (35.8%)	.09
Spironolactone	163 (25.4%)	64 (37.0%)	.004	99 (28.7%)	64 (37.0%)	.069
Beta-blockers	98 (15.3%)	42 (24.3%)	.008	76 (22.0%)	42 (24.3%)	.642
Hemodynamic data						
Systolic blood pressure (mm Hg)	111 (100–121)	106 (99–119)	.021	110 (99–119)	106 (99–119)	.411
Diastolic blood pressure (mm Hg)	70 (63–78)	67 (62–75)	.093	70 (63–77)	67 (62–75)	.236
Heart rate (beats/min)	73 (63–85)	72 (63–83)	.452	70 (61–80)	72 (63–83)	.143
QTc (ms)	449 (428–472)	446 (430–470)	.716	448 (428–470)	446 (430–470)	.984
Laboratory data						
Hemoglobin (g/dL)	10.6 (9.2–12.4)	10.6 (9.1–12.6)	.889	10.8 (9.6–12.4)	10.6 (9.1–12.6)	.48
Platelets ($\times 10^3/\mu\text{L}$)	58 (39–85)	57 (37–80)	.37	56 (38–81)	57 (37–80)	.987
Aspartate aminotransferase (U/L)	48 (33–76)	44 (32–61)	.022	42 (32–63)	44 (32–61)	.887
Alanine aminotransferase (U/L)	31 (20–47)	28 (19–39)	.052	29 (18–40)	28 (19–39)	.871
Total bilirubin (mg/dL)	2.8 (1.3–11)	2.1 (1.3–4.9)	.059	2.1 (1.2–4.8)	2.1 (1.3–4.9)	.576
Albumin (g/dL)	3.1 (2.7–3.6)	3.0 (2.6–3.6)	.371	3.1 (2.7–3.5)	3.0 (2.6–3.6)	.822
Creatinine (mg/dL)	0.8 (0.6–1.0)	0.8 (0.7–1.0)	.682	0.8 (0.6–0.9)	0.8 (0.7–1.0)	.501
Prothrombin time (INR)	1.47 (1.21–1.93)	1.40 (1.21–1.54)	.003	1.39 (1.20–1.67)	1.40 (1.21–1.54)	.624
Donor type			.339			.56
Cadaveric	86 (13.4%)	19 (11.0%)		35 (10.1%)	19 (11.0%)	
Living	555 (86.6%)	154 (89.0%)		310 (89.9%)	154 (89.0%)	
Emergency LT	120 (18.7%)	22 (12.7%)	.083	45 (13.0%)	22 (12.7%)	1
ABO-incompatible LT	80 (12.48%)	25 (14.45%)	.577	49 (14.2%)	25 (14.5%)	1
Operation time (min)	788 (710–889)	786 (717–908)	.715	794 (715–890)	786 (717–908)	.982
Intraoperative RBC transfusion (U)	9 (4–18)	12 (5–20)	.141	9 (4–16)	12 (5–20)	.076
Massive transfusion	452 (70.5%)	124 (71.7%)	.838	247 (71.6%)	124 (71.7%)	1

Value are expressed as the median (interquartile range) or number (%).

Abbreviations: INR, international normalized ratio; LT, liver transplant; MELD, Modified End-stage Renal Disease; RBC, red blood cells.

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