Poor Long-Term Outcomes of Adult Liver Transplantation Involving Elderly Living Donors

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ABSTRACT

Background. Donor hepatectomy requires particular care to ensure the safety of the donor and the success of the liver transplantation. The aim of this study was to evaluate the effect of donor age on the postoperative outcomes of liver transplant donors and the long-term graft survival rates.

Methods. We retrospectively reviewed 56 consecutive adult patients who underwent living donor liver transplantation at our institution between April 2001 and August 2010. Donors and recipients were divided into 2 groups, based on the age of the donor: the elderly donor group (donor age ≥50 years) and the younger donor group (donor age <50 years). Perioperative variables, postoperative complication rates, and long-term graft survival rates were compared between the 2 groups.

Results. The average ages in the elderly donor group and younger donor group were 58 years and 32 years, respectively. Baseline data excluding the age of the donor did not differ between the groups, nor did the overall complication rates of the donors. Hospital stays were longer in the elderly donor group than in the younger donor group (25 vs 18 days, $P < .05$). The 1-, 3-, and 5-year graft survival rates were 80%, 60%, and 50% in the elderly donor group, and 89%, 87%, and 82% in the younger donor group, respectively ($P = .0002$).

Conclusions. Donor hepatectomy can be performed safely in elderly patients. However, compared with younger donors, their hospital stays were longer and the graft survival rates were shorter.

LIVER transplantation is a standard treatment of end-stage liver failure, and its outcome has improved. Because of a serious organ shortage, living donor liver transplantation (LDLT) has become an alternative to deceased donor liver transplantation (DDLT), especially in East Asia, and the use of grafts from elderly donors has become common. Donor hepatectomy requires particular care to ensure donor safety, and advanced donor age is a well-known risk factor in DDLT [1,2]. Although some studies showed that advanced donor age correlated with reduced recipient survival and increased risk of donor complications [3–5], others found that the outcomes of LDLT involving elderly versus younger donors were comparable [6–9]. Therefore, the impact of donor age on the postoperative outcomes of the donors and the long-term outcomes of the recipients has yet to be established. The aim of this study was to address these issues.

METHODS

Patient Selection

We retrospectively identified 94 consecutive patients who received living donor liver transplants in our institution between April 2001 and August 2010. Thirty-eight patients were excluded from this study because the age of the recipient was <18 years. Ultimately, 56 adult recipients were included. Recipients and their associated

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donors were divided into 2 groups, based on the age of the donor: the elderly donor group (donor age ≥50 years, n = 10) and the younger donor group (donor age <50 years, n = 46). The perioperative variables of the donors and the long-term outcomes of the recipients were compared between the 2 groups.

Donor Evaluation

All prospective donors were evaluated via preoperative computed tomography volumetry to estimate their remnant liver volume after donor hepatectomy and their graft volume. An estimated remnant liver volume of >30% was considered optimal, and the lower limit of the graft volume was 40% of the recipient's standard liver volume. All donors underwent intraoperative liver biopsy to determine the degree of hepatosteatosis and intraoperative cholangiography to examine the biliary anatomy.

Immunosuppressive Regimens

Recipients received immunosuppressive treatment consisting of steroids and a calcineurin inhibitor with or without basiliximab. Steroids were administered intravenously at a dose of 20 mg/kg during surgery and then tapered to 1 mg/kg per day within 1 week. Steroid administration was discontinued 6 months after transplantation if feasible. Tacrolimus or cyclosporine was administered on the day of transplantation at a dose of 0.075 or 4 mg/kg twice daily and adjusted to maintain the initial trough level of 10 to 15 or 200 to 300 ng/mL, respectively. Basiliximab (20 mg) was administered intravenously during the anhepatic phase and on postoperative day 4. Two ABO-incompatible patients received rituximab and underwent plasma exchange.

Statistical Analysis

Data are expressed as mean (± standard deviation or range) or median (range) as appropriate. Statistical significance was determined by use of Student *t*-test for normally distributed data, Wilcoxon signed-rank test for skewed data, and Fisher exact test for dichotomous data. Survival rates were determined by use of the Kaplan-Meier method with a log-rank test. Cox proportional-hazards regression test was used to determine the factors that independently influenced posttransplant patient survival. Analyses were performed with the use of JMP Pro 11 software (SAS Institute, Cary, NC, United States). A value of $P < .05$ was considered significant.

RESULTS

Baseline Demographics of Donors and Recipients

The baseline data of the donors and recipients are presented in Table 1. Of the 56 donors included in this study, 10 (17.9%) were at least 50 years of age. The mean donor age at the time of LDLT was 58 (range, 53 to 64) years in the elderly donor group (≥50 years of age) and 32 (range, 18 to 49) years in the younger donor group (<50 years of age). There were no differences between the 2 groups in terms of the sex and body mass index (BMI) of the donors or the age, sex, BMI, type of graft, model for end-stage liver disease score, and primary disease of the recipients. An ABO-incompatible transplantation was performed in only 2 patients in the younger donor group.

Table 1. Baseline Characteristics of the Donors and Recipients

Variable	Donor Age ≥50 Years (n = 10)	Donor Age <50 Years (n = 46)	*P* Value
Donor age, years (mean, range)	58 (53–64)	32 (18–49)	<.001
Donor sex (male/female)	(6/4)	(24/22)	.74
Donor BMI, kg/m^2	22.3 ± 2.1	22.3 ± 3.5	.96
Recipient age, years (mean, range)	48 (28–63)	48 (19–64)	.90
Recipient sex (male/female)	(4/6)	(25/21)	.50
BMI, kg/m^2	22.6 ± 4.4	22.8 ± 3.3	.91
ABO incompatibility	0	2 (4.4%)	.99
Related/unrelated	6/4	38/8	.20
Graft (right lobe/left lobe)	(9/1)	(43/3)	.56
Graft recipient weight ratio	0.94 ± 0.2	1.00 ± 0.2	.34
MELD score	22.9 ± 6.9	21.6 ± 7.7	.65
Primary disease			.18
Hepatitis B virus	2 (20%)	8 (17%)	
Hepatitis C virus	3 (30%)	7 (15%)	
Primary biliary cirrhosis	1 (10%)	13 (28%)	
Acute liver failure	0	7 (15%)	
Biliary atresia	1 (10%)	3 (7%)	
Alcoholic	0	3 (7%)	
Others/unknown	3 (30%)	5 (11%)	

Abbreviations: MELD, model for end-stage liver disease.

Perioperative Outcomes in Donors and Recipients

Donor operation time, amount of donor bleeding (Table 2), and peak levels of total bilirubin (T-bil), aspartate aminotransferase, and alanine aminotransferase after donor hepatectomy (Fig 1) were not significantly different between the elderly and younger donor groups. The median hospitalization period after donor hepatectomy was significantly longer in the elderly donor group (25 days; range, 9–37 days) than in the younger donor group (18 days; range, 6–72 days) (Table 2). The rate of major complications, defined as Clavien-Dindo Grade ≥III, was higher in the donors in the elderly group, although it did not reach statistical significance. There were no differences in post-transplant

Table 2. Outcomes of Donors and Recipients

Variable	Donor Age ≥50 Years (n = 10)	Donor Age <50 Years (n = 46)	*P* Value
Donor			
Operation time, min	503 ± 60	505 ± 144	.97
Bleeding, mL	963 ± 461	897 ± 428	.66
Hospitalization period, days	25 (9–37)	18 (6–72)	<.05
Postoperative complications			
Clavien-Dindo grade ≤II	0	5 (11%)	.57
Clavien-Dindo grade ≥III	3 (30%)	3 (7%)	.06
Recipient			
Post-transplant complications			
Hepatic arterial thrombosis	0	1	.99
Bile leakage	0	6 (13%)	.58
Biliary stricture	3 (30%)	5 (11%)	.14
Biopsy-confirmed acute rejection	2 (20%)	16 (35%)	.47