



## Long-Term Outcome of Living Donor Liver Transplantation for Patients With Alcoholic Liver Disease

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### ABSTRACT

**Background.** Because most liver transplantation (LT) studies for alcoholic liver disease (ALD) were performed on deceased donor LT, little was still known following living donor LT (LDLT).

**Methods.** The clinical outcomes of 126 ALD patients who underwent LDLT for 11 years in a high-volume LT center were assessed retrospectively.

**Results.** ALD cases were 5.7% of adult LDLT indication ( $n = 2196$ ). ALD was 1.9% (4 of 207) during 2000 to 2001, whereas the proportion gradually increased up to 11.3% (34 of 301) in 2010. The model for end-stage liver disease score was  $22.1 \pm 9.9$ , and 6-month abstinence was observed in 105 (83.3%). There were 123 (97.6%) related donors. Single-graft and dual-graft were implanted into 111 and 15 patients, respectively. Main graft type was single right liver graft ( $n = 108$ ; 85.7%). Graft-to-recipient weight ratio was  $1.02 \pm 0.16$ . Perioperative mortality within 3 months occurred in 5 (4.0%). Overall 1-, 3-, 5-, and 10-year patient survival rates were 92.1%, 88.0%, 85.8%, and 83.7%, respectively. Three patients died of alcohol abuse. De novo hepatitis B virus infection occurred in 2 of 26 patients after implantation of core antibody-positive graft and no further cases happened after strict application of prophylaxis.

**Conclusions.** The results of this study revealed that the survival outcome of LDLT in ALD patients is comparable with that of deceased donor LT. To achieve favorable long-term survival, a multidisciplinary approach can be an effective strategy, including the interaction between the patient, the physician, and the family members.

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**A**LCOHOLIC liver disease (ALD) has been one of the most common causes of end-stage liver disease in Western countries. It is now commonly accepted that liver transplantation (LT) is a feasible treatment option for patients with ALD-associated end-stage liver disease [1]. Between 1988 and 2006, ALD was the second most common indication for LT in the United States, accounting for more than 17.1% of all cases [2,3]. A study using the European Liver Transplant Registry (ELTR) during 1996 to 2005 showed that ALD accounted for more than 41.6% of LT indications [4]. Despite excellent outcomes, LT for ALD is still associated with significant controversies, especially regarding alcohol relapse [5,6].

Because there is a high prevalence of ALD and high volume of LT cases in Western countries, most clinical studies on LT for ALD have involved deceased donor LT (DDLT). Due to the shortage of deceased donor organs in

most Eastern countries, adult living donor liver transplantation (LDLT) has been replacing DDLT since the late 1990s. However, ALD had not been regarded as an optimal indication for LDLT because of the self-inflicted nature of ALD and the risk of post-transplantation relapse of alcohol abuse [7,8]. On the other hand, a special relationship

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between the recipient and living donor was considered to make unique clinical latitude toward permitting LDLT in selected patients with pretransplantation abstinence. We have previously presented the importance of pretransplantation abstinence [7].

In this study, we evaluated the long-term outcomes of LDLT for ALD patients in a high-volume LDLT center.

## MATERIALS AND METHODS

This study was performed in the form of a retrospective clinical study with eligible patients recruited from our institutional LT database. During the 11-year study period from January 2000 to December 2010, 2196 adult LDLTs were performed.

Of them, 126 recipients (5.7%) were primarily diagnosed with ALD after exclusion of concurrent association with viral hepatitis or other underlying diseases. ALD patients underwent strict psychiatric evaluation before determination of LDLT planning. Acute alcoholic hepatitis was not indicated for LDLT in our institution, thus all ALD cases meant alcoholic liver cirrhosis. These patients were confirmed as having ALD, based on both a history of chronic alcohol intake and a profile of biochemical parameters. Alcoholic cirrhosis was later confirmed using histological examination of the explanted liver. These patients were followed up until August 2013. Their medical records were retrospectively reviewed.

To compare the duration of post-transplantation hospital admission, a control group of 100 adult LDLT patients having a model for end-stage liver disease (MELD) score of 25 or less and hepatitis B virus (HBV) association were selected after matching of gender, age, and graft size.

Independence from alcohol was confirmed based on pretransplantation psychiatric assessment. Six months of alcohol abstinence was requested before LDLT. Since it was not practical to define alcoholic relapse as consumption of more than a given amount of alcohol after LT, alcohol relapse was arbitrarily defined as any consumption of alcohol [7]. Close surveillance of alcohol drinking has been performed routinely at follow-up during every outpatient visit.

Surgical procedures for LDLT were described in detail elsewhere [8–10]. The immunosuppression regimen was the same as for other indications of adult LDLT, including anti-interleukin 2 induction, calcineurin inhibitors, mycophenolate mofetil, and corticosteroid.

The primary end-point of this study was set to analyze the survival outcome of LDLT in ALD patients, and the secondary end-point was to reveal the patterns of alcohol relapse.

This study protocol was approved by the institutional review board of our institution. All continuous numeric variables are reported as mean with standard deviation or as median with range and compared with Student *t* test. Incidence was compared with chi-square test. Patient survival rates were estimated using the Kaplan-Meier method and compared with the log-rank test. *P* < .05 was considered statistically significant.

## RESULTS

### Patient and Donor Demographics

The clinical profiles of the 126 patients are summarized in Table 1. Their mean MELD score was  $22.1 \pm 9.9$ . Liver cirrhosis-associated complications occurred in 71 (56.3%), and 4 patients were classified as acute-on-chronic liver

**Table 1. Demographic Characteristics of 126 ALD Patients Who Underwent LDLT**

Parameters	Values
Age (y)	$51.2 \pm 2.4$ (range, 31–69)
Male gender (n)	112 (88.9%)
Marital status (n)	118 (93.7%)
College education or higher (n)	38 (30.2%)
Job occupied state (n)	80 (63.5%)
Alcohol abstinence $\geq 6$ m (n)	105 (83.3%)
MELD score (mean)	$22.1 \pm 9.9$ (range, 8–47)
Liver cirrhosis complication (n)	71 (56.3%)
Alert mentality at admission (n)	111 (88.1%)
Acute-on-chronic liver failure (4)	4 (3.2%)
Anti-HBs positivity	91 (72.2%)
Urgent transplantation	12 (9.5%)
Concurrent hepatocellular carcinoma	20 (15.9%)

Abbreviation: anti-HBs, antibody to HBV surface antigen.

failure. Alcohol abstinence  $\geq 6$  months was not met in 21 (16.7%), but none of these patients underwent LDLT in urgent situations. The annual proportion of urgent LT was rapidly decreased after increase of deceased-organ donation since 2008.

The demographic profiles of living donors are summarized in Table 2. Because of 15 cases of dual-graft LDLT, the total number of living donors became 141. Nearly all living donors except 3 (97.6%) were consanguineously or maritally related to the recipients. Of them, 112 donors (79.4%) had very close donor-recipient relationships, such as children, siblings, and spouses. There was 1 case of ABO blood group-incompatible LT and 1 case of donor exchange LDLT. All of these donors recovered uneventfully after liver donation operations.

### Operation and Surgical Complications

Single-graft and dual-grafts were implanted into 111 and 15 patients, respectively (Table 3). Total graft-to-recipient weight ratio (GRWR) was  $1.02 \pm 0.16$ .

Perioperative mortality within 3 months occurred in 5 patients (4.0%). The duration of post-transplantation hospital admission was assessed between the ALD group with a MELD score  $\leq 25$  and the HBV group with a MELD score  $\leq 25$ , in which the ALD group showed a prolonged median admission duration of 24.5 days (vs 21.6 days in the

**Table 2. Demographic Characteristics of 141 Living Donors**

Parameters	Values
Age (y)	$28.5 \pm 8.3$ (range, 16–55)
Male gender (n)	98 (77.8%)
Relationship of donor to recipient (n)	
Spouse	8
Child	80
Sibling	24
Relative	26
Unrelated	3
Anti-HBc positivity (n)	27 (19.1%)

Abbreviation: anti-HBc, antibody to HBV core antigen.

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