Psychosocial characteristics of alcoholic and non-alcoholic liver disease recipient candidates in liver transplantation: A prospective observational study

Masato Shizuku

Nagoya University: Nagoya Daigaku

hiroyuki kimura (✉ kimurahi@med.nagoya-u.ac.jp)

Nagoya University: Nagoya Daigaku <https://orcid.org/0000-0002-6156-5828>

Hideya Kamei

Nagoya University: Nagoya Daigaku

Shinichi Kishi

Nagoya University: Nagoya Daigaku

Tatsuya Tokura

Nagoya University: Nagoya Daigaku

Nobuhiko Kurata

Nagoya University: Nagoya Daigaku

Kanta Jobara

Nagoya University: Nagoya Daigaku

Atsushi Yoshizawa

Nagoya University: Nagoya Daigaku

Chisato Tsuboi

Nagoya University: Nagoya Daigaku

Naoko Yamaguchi

Nagoya University: Nagoya Daigaku

Midori Kato

Nagoya University: Nagoya Daigaku

Keita Kawai

Nagoya University: Nagoya Daigaku

Makoto Yamashiki

Nagoya University: Nagoya Daigaku

Emi Kanai

Nagoya University: Nagoya Daigaku

Kanako Ishizuka

Nagoya University: Nagoya Daigaku

Norio Ozaki

Nagoya University: Nagoya Daigaku

Yasuhiro Ogura

Nagoya University: Nagoya Daigaku

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Abstract

Background/Aim

There are long-standing controversies about the transplant indications for alcoholic liver disease (ALD), because of the recognition that ALD is fundamentally self-inflicted. However, it is unclear whether stigmatization of ALD based on psychosocial aspects is warranted in the selection of liver transplantation (LT) recipients. We aimed to clarify the psychosocial characteristics of ALD recipients (ALD-R)/ALD recipient candidates (ALD-RC) and non-ALD recipients (NALD-R)/non-ALD recipient candidates (NALD-RC).

Methods

From 2011 to 2019, 75 patients were enrolled in this prospective observational study (ALD-RC, $n = 19$; NALD-RC, $n = 56$), LT were carried out as follow; ALD-R, $n=6$; NALD-R, $n=52$. We evaluated psychosocial characteristics in the preoperative period and 3, 12 months after LT (ALD-R, $n = 3/3$; NALD-R, $n = 28/25$). The following scales were used to evaluate psychosocial characteristics: Visual Analogue Scale, Alcohol Use Disorders Identification Test, Hospital Anxiety and Depression Scale, Beck Depression Inventory, Brief Evaluation of Medication Influences and Beliefs, Social Support Questionnaire (SSQ), Temperament and Character Inventory, Parental Bonding Instrument (PBI), the Short Form Health Survey (SF-36).

Results

A comparison of ALD-RC and NALD-RC in the preoperative period identified similar patterns of psychosocial characteristics, except that the NALD-RC scored higher on the PBI item "overprotection from mother" ($P < 0.05$). The only significant difference between ALD-R and NALD-R after liver transplantation was in SSQ scores at 3 months.

Conclusion

The psychosocial characteristics of ALD-RC and NALD-RC were similar. Therefore, stigmatization of ALD-RC based on psychosocial aspects is unwarranted and appropriate evaluation is needed.

Introduction

Liver transplantation for alcoholic liver disease involves many issues, such as the validity of the 6-month abstinence rule [1-3], indications regarding liver transplantation for acute alcoholic hepatitis [4-6] and alcohol relapse [7,8]. In particular, the importance of psychosocial evaluation before and after liver transplantation has been emphasized to prevent alcohol relapse [9,10]. It is generally assumed that alcoholic liver disease patients have experienced previous alcoholic dependence. Therefore, it is very important to manage alcohol relapse in recipients of liver transplantation for alcoholic liver disease. Research shows that postoperative psychological intervention reduces the risk of alcohol relapse after liver transplantation [11-14].

We recognize that alcohol dependence or alcohol-related diseases pose distinctive problems in a clinical setting. Indeed, we tend to consider recipients of liver transplantation for alcoholic liver disease as alcohol-dependent patients who have other addictions, depression, and alcohol-related problems. However, the alcohol relapse rate of liver transplantation recipients who had alcoholic liver disease is approximately 30%–40% [2,15,16], whereas that of alcohol-dependent patients is approximately 60%–70% [11,12]. Despite this evidence, it is difficult to avoid stigmatization when evaluating candidates of liver transplantation for alcoholic liver disease.

There are many studies on psychosocial evaluations for liver transplantation recipients; however, it is unclear whether psychosocial characteristics differ between alcoholic liver disease recipient candidates (ALD-RC) and non-alcoholic liver disease recipient candidates (NALD-RC). To our knowledge, there are no previous reports on such differences in psychosocial characteristics. The aim of this study was to clarify the psychosocial characteristics of ALD-RC and inform the appropriate selection of liver transplantation recipient candidates.

We performed a prospective observational study that focused on the following three points. First, we compared the psychosocial characteristics of ALD-RC and NALD-RC before liver transplantation. Second, we evaluated psychosocial characteristics consecutively in liver disease recipient (ALD-R) and non-alcoholic liver disease recipient (NALD-R) patients who actually received liver transplantation at 3 and 12 months after liver transplantation. Third, we compared scores on the Medical Outcomes Study 36-Item Short Form Health Survey (SF-36) between ALD-R and published Japanese norms at 3 and 12 months after liver transplantation.

Materials And Methods

Study population and data collection

In this prospective observational study, we enrolled 75 liver transplantation recipient candidates aged 16 years or older (ALD-RC, $n = 19$; NALD-RC, $n = 56$) who were referred to our hospital from January 2011 to December 2019. The recipient candidates in this study were patients who met the physical criteria for liver transplantation based on the ethical guidelines of the Japan Society for Transplantation [17,18].

To conduct appropriate assessment of indications for liver transplantation, our center created a transplantation medical team in 2004. This team comprises transplant surgeons, gastroenterologists, hepatologists, psychiatrists, transplant coordinators, and psychologists. When patients are referred to our hospital, transplant surgeons, gastroenterologists, and hepatologists evaluate physical aspects such as transplantation indications, primary liver disease, blood tests, model for end-stage liver disease score, and Child–Pugh classification. In Japan, the transplantation criteria about alcohol use disorder indicates that absolute contraindication only for alcohol use disorders without 6 months of sobriety (changed to 18 months after 2014), therefore, ALD-RC are required to have followed a 6-month abstinence rule at the initial assessment. Following physical evaluation, transplant coordinators check their family situation and support system. Psychiatrists and psychologists check psychosocial characteristics, namely

performance on the Visual Analogue Scale (VAS), Alcohol Use Disorders Identification Test (AUDIT), Hospital Anxiety and Depression Scale (HADS), Beck Depression Inventory (BDI), Brief Evaluation of Medication Influences and Beliefs (BEMIB), Social Support Questionnaire (SSQ; Number of Persons, NP; Satisfaction Rating, SR), Temperament and Character Inventory (TCI), Parental Bonding Instrument (PBI), and the Medical Outcomes Study 36-Item Short Form Health Survey (SF-36; Physical Component Summary, PCS; Mental Component Summary, MCS).

The team continues to hold interdisciplinary conferences every week to share patient information [10]. After liver transplantation, all patients received ongoing support from psychiatrists and psychologists and, in cases of comorbid psychiatric disorders, received psychiatric treatment such as pharmacotherapy or psychotherapy.

In this study, we conducted the following three investigations. First, we compared psychosocial characteristics, namely scores on the VAS, AUDIT, HADS, BDI, BEMIB, SSQ (NP/SR), TCI, PBI, and SF-36 (PCS/MCS), between ALD-RC and NALD-RC before liver transplantation. Second, we evaluated psychosocial characteristics, namely scores on the VAS, AUDIT, HADS, BDI, BEMIB, SSQ (NP/SR), SF36 (PCS/MCS), at the preoperative period and at 3 and 12 months after liver transplantation for patients who received liver transplantation. Third, we compared SF-36 scores between ALD-R and published Japanese norms at 3 and 12 months after liver transplantation. Japanese norms were obtained from data reported by Fukuhara et al., “Manual of SF-36 Japanese version 1.2” [19-21].

Although we cannot rule out selection bias, we hoped to avoid this as much as possible by identifying all patients diagnosed within a specific period of time.

Measurements

The **VAS** assesses subjective characteristics or attitudes that cannot be directly measured. Scores range from 0 to 100 points [22,23]. We measured pain in this study. The **AUDIT** is a measurement tool to screen patients for possible alcoholism. The AUDIT comprises a 10-item questionnaire and is a simple and useful method for early detection of harmful alcohol use [24]. The **HADS** scale assesses levels of anxiety and depression. The Japanese version of the HADS questionnaire was used to assess patients' depression severity [25,26]. Higher scores indicate more severe symptoms. The **BDI** is a self-rating measurement tool developed by Beck et al.; it has high diagnostic utility for depression [27,28]. The **BEMIB** was developed to identify non-adherence in patients with psychiatric disorders and consists of an 8-item scale. In this study, we used the Japanese version of the BEMIB [29]. The **SSQ** measures social support and satisfaction with social support from the perspective of the interviewee. The SSQ consists of two subscales: the Number of Persons (NP) subscale, which reflects the sum of the perceived number of others who provide social support, and the Satisfaction Rating (SR) subscale, which reflects the sum of the individual's degree of satisfaction with perceived social support. In this study, the six-item Japanese version of the SSQ was used [30,31]. The **TCI** assesses personality characteristics. According to Cloninger [32,33], personality can be divided into temperament (Novelty Seeking, Harm Avoidance, Reward Dependence, Persistence) and character domains (Self-directedness), Cooperativeness), Self-

transcendence). Participants respond to each TCI item by answering “true” or “false” and a total score for each temperament and character dimension is calculated. In this study, we used the Japanese version of the TCI [34]. The **PBI** assesses perceived rearing [35]. The PBI is a self-report questionnaire that evaluates a person’s perception of how they were raised by asking the respondent to recall their parents’ child-rearing attitudes before the age of 16 years. The PBI consists of four categories: paternal care, paternal overprotection, maternal care, and maternal overprotection, and scores are obtained for each category. In this study, we used the Japanese version of the scale [36]. The **SF-36** is a 36-item patient-reported survey of patient health. Administration of the SF-36 generates a health profile on eight domains: general health, physical function, role physical, bodily pain, vitality, social functioning, mental health, and role emotional. The SF-36 also provides two higher-order summary scores: the physical component summary (PCS) and the mental component summary (MCS). Scores for each summary range from 0 to 100. Higher scores indicate better health-related quality of life [37]. Published Japanese norms were used as a comparison for SF-36 scores. We compared recipients’ health as measured by the SF-36 with national standards using these norms [19-21].

Statistical analysis

Statistical analyses were performed using SPSS, version 25 (IBM, Armonk, NY, USA). Continuous variables were compared by *t* test and Mann-Whitney U test.

Homogeneity of variance was evaluated using Levene’s test. For between-group comparisons, Student’s *t*-test was used if the data showed homogeneity of variance. In the absence of homogeneity of variance, Welch’s method was used. The chi-square test was used to examine differences between categorical variables. A *P*-value of <0.05 was regarded as statistically significant. We did not determine an a priori sample size; owing to the small pool of study subjects, we conducted the analysis using the maximum sample size available. We compensated by checking the effect size after the analysis. Because of the exploratory nature of this study, we did not adjust for multiple comparison issues. A statistical review of the study was performed by a biomedical statistician.

Ethical approval

The study protocol was performed in accordance with the Declaration of Helsinki and was approved by the ethics review committee of Nagoya University Graduate School of Medicine (Approval No. 2012-0339) and all participants provided written informed consent to take part in the study. This study was fully supported by a Grant-in-Aid for Scientific Research (C, No. 24591875) from the Japanese Ministry of Education, Culture, Sports, Science and Technology and by a grant from the Japanese Society for the Promotion of Science.

Results

Participant results are shown in **Figure 1**. The number of evaluable patients in the ALD-RC and NALD-RC groups was 19 and 56, respectively. Of the 19 ALD-RC, 6 (31.6%) actually underwent liver transplantation

(living donor liver transplantation: 5; deceased donor liver transplantation: 1), 8 (42.1%) died waiting for a transplant, 1 (5.2%) experienced alcohol relapse, and 4 (21.1%) were still waiting for liver transplantation. One patient was excluded from liver transplantation indication because of alcohol relapse. The patient was a 38-year-old man who had been treated for alcoholic cirrhosis for five years. On physical and psychosocial evaluation, he appeared to meet the evaluation criteria for liver transplantation but was subsequently found to have a small amount of alcohol relapses, which prompted a reevaluation. However, he did not receive support from a psychiatrist and psychologist before liver transplantation because he lived far away. Of the 56 NALD-RC, 52 (92.9%) actually underwent liver transplantation (living donor liver transplantation: 43; deceased donor liver transplantation: 9), 2 (3.6%) died waiting for a transplant, 1 (1.8%) experienced improvement, and 1 (1.8%) was still waiting for liver transplantation. The number of patients evaluated at 3 months after liver transplantation in the ALD-R and NALD-R groups was 3 and 28 patients, respectively. At 12 months after liver transplantation, 3 ALD-R and 25 NALD-R were evaluated.

The demographic characteristics of the ALD-RC and NALD-RC groups are shown in **Table 1**. There was no significant difference in any of the variables. The primary diseases of the ALD-RC are shown in **Table 2**. The perioperative characteristics of the ALD-R and NALD-R who received liver transplantation are shown in **Table 3**. There was no significant between-group difference in any of the variables.

The comparison of psychosocial characteristics in the ALD-RC and NALD-RC groups before liver transplantation is shown in **Table 4**. The only significant between-group difference was for “overprotection from mother”; the NALD-RC group scored higher on this characteristic.

Table 5 shows the results of the between-group comparisons in scores on the VAS, AUDIT, HADS, BDI, BEMIB, SSQ (NP/SR), and SF-36 (PCS/MCS) at 3 and 12 months after liver transplantation for ALD-R and NALD-R. The only significant between-group difference was for SSQ (NP) score at 3 months after liver transplantation; the ALD-R group scored higher than the NALD-R group on the SSQ (NP).

Figure 2 shows the comparison of SF-36 (PCS/MCS) scores between ALD-R and published Japanese norms. Although the PCS score in the ALD-R group was significantly lower than published Japanese norms preoperatively and 12 months after liver transplantation, there was no significant difference in MCS score at any time. These results indicate that the ALD-R had significantly lower physical health than national standards not only preoperatively but also 12 months after liver transplantation. In contrast, there was no significant between-group difference in mental health at any time.

Discussion

Although ALD is one of the indications for liver transplantation, psychosocial evaluation of ALD patients is extremely important. As patients with alcohol-related disease may be stigmatized, appropriate systematic psychosocial evaluation may not be performed in each case. Indeed, it is unclear whether psychosocial characteristics differ between ALD-RC and NALD-RC. Our study is the first prospective observational study to examine the psychosocial characteristics of recipient candidates in detail. It may

be inconclusive to result in that ALD-R and NALD-R showed the similar psychosocial aspects because of a small group of patients after liver transplantation, but we found that the psychosocial characteristics of ALD-RC and NALD-RC were similar; therefore, stigmatization of ALD-RC based on psychosocial aspects is unwarranted.

There is a general tendency to consider alcohol-dependent patients as weak-willed and non-compliant and their illness as self-inflicted. However, previous studies have reported a considerable difference in the rate of alcoholic relapse between liver transplantation recipients [2,15,16] and alcohol-dependent patients [11,12]. It is unclear whether the ALD-RC group experienced previous alcohol dependence, but we consider that the psychosocial characteristics of ALD-RC are different from those of NALD-RC in a clinical setting (although there is no clear evidence for this). The present findings demonstrated almost identical psychosocial characteristics between the ALD-RC and NALD-RC groups. There are four explanations for this similarity. First, the pre-referral of recipient candidates for liver transplantation by previous doctors may have resulted in a selection effect by excluding patients with very poor psychiatric symptom control. Second, patients had a sufficient and enthusiastic family support system. Third, patients' alcohol abstinence may have been prompted by others' expressions of disgust during frequent treatment or hospitalization. Fourth, patients may have been heavy drinkers, but they were not alcohol dependent. However, although the psychosocial characteristics of the ALD-RC and NALD-RC groups were very similar, the psychosocial evaluation used for recipient candidates in this study may make it difficult to identify differences between these groups. In future, we may need to use other newly developed scales for this evaluation.

Notably, the readers need to consider the social background of each country such as alcohol-drinking behavior or medical system in interpreting this study. In other countries like Western countries, it was known that ALD was associated with parental neglect or abuse [38-40], whereas our study was the opposite results, in that, over-protection from mother. There were no studies to validate this issue distinctly, but previous studies have demonstrated over-protection from supporters/ partners was higher in patients with physical disease such as diabetes mellitus or myocardial infarction [41,42]. The paradoxical results in our study may have been caused by events like described above or social background unique to Japan. Additionally, As shown in Figure 1, the rate of died candidates waiting for liver transplantation was different between ALD-RC (42.1%) and NALD-RC (3.6%). In Japan, approximately 85% of liver transplantation were live donor liver transplantation because of the lack of deceased donor [43]. Therefore, if the patients do not have potential donors in their family, they lose the opportunity for liver transplantation. Because the selection of donor was based on the voluntary, there might be potentially fewer family members who offered for donor in ALD-RC. Additionally, Japanese transplantation criteria for alcohol use disorder might lead fewer chance to receive liver transplantation with deceased donor. Thus, the readers are needed to consider domestic situations in interpretation of this article.

In this study, we also compared the ALD-R group performance with published Japanese norms for PCS and MCS. Our results showed that the PCS score in the ALD-R group was significantly lower than

published Japanese norms, not only preoperatively but also 12 months after transplantation. However, there was no significant difference in MCS score at any time. Previous studies have reported that PCS scores are lowest preoperatively, but gradually recover from the first month after transplantation, and MCS scores recover rapidly from 1 month after transplantation [44,45]. Our results are similar, in that we also found that PCS and MCS scores gradually recovered from 3 months after transplantation.

One study limitation is that we did not directly compare the psychosocial characteristics of ALD-RC and alcohol-dependent patients; therefore, further research is needed. Another limitation of this study is that it was a single-institution prospective observational study and a small group of patients, so we have not examined whether the finding of no difference in psychosocial characteristics between ALD-RC and NALD-RC is unique to our hospital or is characteristic of patients in other hospitals or countries. Future multicenter collaborative research is needed to investigate this issue.

In conclusion, although there were controversies about the psychosocial aspects between ALD-R and NALD-R because of a small group of patients after liver transplantation, we found that the psychosocial characteristics of ALD-RC and NALD-RC were similar, suggesting that the stigmatization of ALD-RC based on psychosocial aspects is unwarranted. This important finding indicates that we must appropriately evaluate both ALD-RC and NALD-RC patients without stigmatization.

Abbreviations

ALD: alcoholic liver disease

LT: liver transplantation

ALD-R: ALD recipients

ALD-RC: ALD recipient candidates

NALD-R: non-ALD recipients

NALD-RC: non-ALD recipient candidates

SSQ: Social Support Questionnaire(NP: Number of Persons, SR: Satisfaction Rating)

PBI: Parental Bonding Instrument

SF-36: the Medical Outcomes Study 36-Item Short Form Health Survey(PCS: Physical Component Summary, MCS: Mental Component Summary)

VAS: Visual Analogue Scale

AUDIT: Alcohol Use Disorders Identification Test

HADS: Hospital Anxiety and Depression Scale

BDI: Beck Depression Inventory

BEMIB: Brief Evaluation of Medication Influences and Beliefs

TCI: Temperament and Character Inventory

PBI: Parental Bonding Instrument

Declarations

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Disclosure of financial arrangements

The authors declare no conflicts of interest associated with this manuscript.

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Author contributions

Shizuku M and Kimura H contributed equally to this work of participating in designing the research, performing data collection, performing data analysis, and writing the article.; Kishi S and Tokura T participated in data collection and assisted with data analysis.; Kurata N, Jobara K, Yoshizawa A, Tsuboi C, Yamaguchi N, Kato M, Kawai K, Yamashiki M, Kanai E and Ishizuka K participated in data collection.; Kamei H assisted with data analysis and contributed to writing the article.; Ozaki N provided academic opinions on psychiatry and supervised this research.; Ogura Y helped supervised the study and critically revised the manuscript.

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Compliance with Ethical Standards

Conflict of interest: The authors declare no conflicts of interest associated with this manuscript.

Informed consent: All study participants provided informed written consent prior to study enrollment.

Availability of data and materials: The datasets used and analyzed during the current study are available from the corresponding author on reasonable request.

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Tables

Table 1 Demographic characteristics of the ALD-RC and NALD-RC groups

Variables	ALD-RC group (<i>n</i> = 19)	NALD-RC group (<i>n</i> = 56)	<i>P</i> -value
Age (mean years, range)	47.7 (37–60)	46.8 (16–67)	0.82
Gender (Male / Female)	11 / 8	26 / 30	0.29
AST (IU/L) (mean, SD)	52.1 (28.1)	247.8 (1085.0)	0.44
ALT (IU/L) (mean, SD)	27.8 (15.0)	184.6 (763.5)	0.39
Hepatic encephalopathy (point, mean, SD)	1.2 (0.4)	1.3 (0.5)	0.25
Ascites (point, mean, SD))	1.8 (0.8)	2.0 (0.9)	0.48
Total Bilirubin (mg/dL) (mean, SD)	7.7 (7.3)	8.6 (10.9)	0.76
Albumin (g/dL)	2.9 (0.5)	2.8 (0.7)	0.58
Prothrombin time (%) (mean, SD)	46.5 (17.2)	57.1 (20.9)	0.10
PT-INR (mean, SD)	1.61 (0.4)	1.51 (0.6)	0.69
Creatinine (mg/dL) (mean, SD)	0.84 (0.4)	1.07 (1.3)	0.49
MELD score (point) (mean, SD)	18.1 (6.2)	18.1 (10.2)	0.93
Child-Pugh score (point) (mean, SD)	10.3 (1.7)	9.9 (2.3)	0.55
Primary liver disease			
Number of HCC (%)	5 (26.3)	5 (8.9)	0.11

ALD-RC: Alcoholic liver disease recipient candidate; ALT: Alanine transaminase; AST: Aspartate transaminase; HCC: Hepatocellular carcinoma; NALD-RC: Non-alcoholic liver disease recipient candidate; MELD: Model for end-stage liver disease score; PT-INR: International normalized ratio of prothrombin time; SD: Standard deviation.

Table 2 The primary disease of the ALD-RC and NALD-RC

	ALD-RC (n=19)	NALD-RC (n=56)
Primary liver disease		
Alcoholic liver cirrhosis	14	0
Alcoholic liver cirrhosis with HCC	5	0
Primary sclerosing cholangitis	0	9
Primary biliary cholangitis	0	8
Biliary atresia	0	5
Non-alcoholic steatohepatitis	0	5
Autoimmune hepatitis	0	4
Fulminant hepatitis	0	4
Hepatic C virus related cirrhosis	0	3
Polycystic liver disease	0	3
Hepatic B virus related cirrhosis with HCC	0	3
Hepatic B virus related cirrhosis	0	2
Hepatic C virus related cirrhosis with HCC	0	2
Wilson disease	0	1
Hepatic fibrosis	0	1
Idiopathic portal hypertension	0	1
Congenital biliary dilatation	0	1
Hypoplastic right hepatic lobe	0	1
Unknown	0	3

ALD-RC, Alcoholic Liver Disease Recipient Candidate; HCC, Hepatic Cell Carcinoma; NALD-RC, Non-Alcoholic Liver Disease Recipient Candidate;

Table 3 A comparison of perioperative characteristics for ALD-R and NALD-R groups

Variables	ALD-R group (<i>n</i> = 6)	NALD-R group (<i>n</i> = 52)	<i>P</i> -value
Age (mean, range)	52.3 (46–60)	46.5 (16–67)	0.31
Gender (Male / Female)	3 / 3	24 / 28	0.87
MELD score (point) (mean ± SD)	20.0 ± 8.6	17.9 ± 10.6	0.65
Operation time (min) (mean ± SD)	698 ± 53	757 ± 157	0.39
Blood loss (ml)	10615 (4468)	9295 (8353)	0.77
Donor type (Decease / Living)	1 / 5	9 / 43	0.98
Graft type (left/right/whole)	1 / 4 / 1	4 / 40 / 8	0.78
Blood type (identical / compatible/ incompatible)	5 / 0 / 1	31/ 13 / 8	0.37
Hospital stay (day) (mean, SD)	79.0 (37.7)	83.1 (79.9)	0.90
Follow up period (day) (mean, range)	1160 (478– 2150)	1626 (107– 3874)	0.25
Postoperative outcomes			
Alive (%)	5 (83.3)	47 (90.4)	0.61
Dead (%)	1 (16.7)	5 (9.6)	
Postoperative complications			
Clavien-Dindor classification Grade ≥ IIb (%)	3 (50.0)	16 (30.8)	0.39

ALD-R: Alcoholic liver disease recipient; MELD: Model for end-stage liver disease score; NALD-R: Non-alcoholic liver disease recipient; SD: Standard deviation.

Table 4 Comparison of psychosocial characteristics between ALD-RC group and NALD-RC group before liver transplantation

	ALD-RC	NALD-RC	t	df	<i>P</i>	<i>r</i>
	<i>n</i> = 19	<i>n</i> = 56				
Variables	Mean (SD)	Mean (SD)				
VAS [‡]	14.28 (18.32)	15.52 (20.52)	-	-	0.87	
AUDIT	3.67 (6.06)	1.65 (3.62)	1.64	62	0.11	
HADS	9.83 (7.51)	9.60 (6.59)	0.12	58	0.90	
BDI	11.44 (9.49)	9.07 (7.11)	1.07	59	0.29	
BEMIB	28.33 (5.49)	28.44 (4.80)	-0.07	45	0.95	
SSQ						
NP	4.11 (1.84)	4.82 (2.97)	-0.94	60	0.35	
SR	5.24 (0.81)	5.09 (1.22)	0.47	58	0.64	
TCI						
Novelty Seeking	8.63 (2.73)	8.10 (2.57)	0.67	53	0.50	
Harm Avoidance	11.38 (4.95)	11.26 (4.04)	0.09	53	0.93	
Reward Dependence	9.31 (1.99)	10.11 (2.13)	-1.27	51	0.21	
Persistence	2.24 (1.92)	2.78 (1.53)	-1.03	25	0.31	
Self-Directedness	14.19 (4.46)	16.09 (5.14)	-1.27	47	0.21	
Cooperativeness	17.47 (3.63)	18.42 (3.21)	-0.98	53	0.33	
Self-Transcendence	3.67 (2.95)	3.62 (3.05)	0.06	55	0.95	
PBI						
Care / Father	15.31 (8.20)	11.97 (9.62)	1.22	53	0.23	
Over-protection / Father	29.00 (5.65)	29.66 (6.73)	-0.34	52	0.73	
Care / Mother	12.94 (8.34)	8.08 (9.31)	1.90	56	0.06	
Over-protection / Mother	23.41 (7.39)	28.71 (7.69)	-2.39	53	0.02	0.31
SF-36						
PCS	26.84 (21.35)	28.68 (17.85)	-0.30	47	0.77	
MCS	49.80 (12.68)	44.65 (11.34)	1.36	47	0.18	

ALD-RC: Alcoholic liver disease recipient candidate; AUDIT: Alcohol Use Disorders Identification Test; BDI: Beck Depression Inventory; BEMIB, Brief Evaluation of Medication Influences and Beliefs; HADS: Hospital

Anxiety and Depression Scale; NALD-RC: Non-alcoholic liver disease recipient candidate; PBI: Parental Bonding Instrument; SF-36: Medical Outcomes Study 36-Item Short Form Health Survey (PCS: Physical Component Summary; MCS: Mental Component Summary); SSQ: Social Support Questionnaire (NP: Number of Persons; SR: Satisfaction Rating); TCI: Temperament and Character Inventory; VAS: Visual Analogue Scale.

☐ Mann-Whitney t test was used to evaluate the differences between two groups.

Table 5 A comparison of ALC-group and NALD-R group at 3 and 12 months after liver transplantation

Variables	3 months after liver transplantation			12 months after liver transplantation		
	ALD-R	NALD-R	p	ALD-R	NALD-R	p
	n=3	n=28		n=3	n=25	
	Mean ± SD	Mean ± SD		Mean ± SD	Mean ± SD	
AUDIT	0.00 ± 0.00	0.46 ± 1.25	0.54	0.00 ± 0.00	0.33 ± 1.27	0.66
HADS(T)	3.67 ± 3.22	9.46 ± 7.31	0.19	2.00 ± 2.65	7.64 ± 7.33	0.20
BDI	8.67 ± 7.51	9.52 ± 8.03	0.86	4.67 ± 4.04	8.68 ± 7.66	0.39
BEMIB	33.33 ± 4.16	31.79 ± 4.34	0.56	34.00 ± 3.46	34.09 ± 3.04	0.96
SSQ						
NP	9.50 ± 6.30	4.67 ± 3.52	0.04	5.06 ± 1.01	4.35 ± 2.08	0.57
SR	5.67 ± 0.58	5.06 ± 1.06	0.35	5.08 ± 0.12	5.17 ± 0.93	0.89
SF-36						
PCS	17.47 ± 28.25	26.03 ± 16.63	0.47	37.42 ± 10.93	43.80 ± 12.55	0.41
MCS	57.33 ± 14.03	54.22 ± 9.91	0.62	58.65 ± 6.77	53.77 ± 9.31	0.39

ALD-RC, Alcoholic Liver Disease Recipient Candidate; AUDIT, Alcohol Use Disorders Identification Test; BDI, Beck Depression Inventory; BEMIB, Brief Evaluation of Medication Influences and Beliefs; HADS, Hospital Anxiety and Depression Scale; NALD-RC, Non-Alcoholic Liver Disease Recipient Candidate; SF-36, The Medical Outcomes Study 36-item short form Health Survey (PCS, Physical Component Summary; MCS, Mental Component Summary); SSQ, Social Support Questionnaire (NP, Number of Persons; SR, Satisfaction Rating);

Figures

Figure 1

Flow chart of participants enrolled in this study. Data were responses to questionnaires that were mailed to all subjects and returned to us. Statistical analysis was performed after excluding missing data. □ Compared with published Japanese norms

Comparison of SF-36 scores in ALD-R group and published Japanese norms

Figure 2

Comparison of SF-36 scores in ALD-R group and published Japanese norms. Although PCS scores in ALD-R were significantly lower than published Japanese norms preoperatively and at 12 months after transplantation, there was no significant difference in MCS scores at any time. ALD-R: Alcoholic liver disease recipient; MCS: Mental component summary; PCS: Physical component summary; SF-36: Short Form Health Survey.