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BRIEF ARTICLE

Quality of life and psychological outcome of donors after living donor liver transplantation

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Abstract

AIM: To investigate the health related quality of life (HRQoL) and psychological outcome of donors after living donor liver transplantation.

METHODS: Participants were 92 consecutive liver transplant donors who underwent hepatectomy without middle hepatic vein at West China Hospital of Sichuan University between January 2007 and September 2010. HRQoL was measured using the Chinese version of the Medical Outcomes Study Short Form-36 (SF-36), and psychological symptoms were measured using the Symptom Checklist-90-Revised (SCL-90-R). Data collected from donors were compared to previously published data from the general population. Clinical and demographic data were collected from medical records and questionnaires.

RESULTS: The general health score of the SF-36 was significantly lower in females (59.78 ± 12.25) than in males (75.83 ± 22.09). Donors more than 40 years old scored higher in social functioning (85.71 ± 14.59) and mental health (82.61 ± 20.00) than those younger than 40 (75.00 ± 12.13, 68.89 ± 12.98; social functioning and mental health, respectively). Donors who had surgery more than two years prior to the study scored highest in physical functioning (P = 0.001) and bodily pain (P = 0.042) while those less than one year from surgery scored lowest. The health of the liver recipient significantly influenced the general health (P = 0.042), social functioning (P = 0.010), and role-emotional (P = 0.028) of donors. Donors with full-time employment scored highest in role-physical (P = 0.005), vitality (P = 0.001), social functioning (P = 0.016), mental health (P < 0.001), the physical component summary scale (P < 0.001), and the mental component summary scale (MCS) (P < 0.001). Psychological measures indicated that donors were healthier than the general population in obsessive-compulsive behavior, interpersonal sensitivity, phobic anxiety, and paranoid ideation. The MCS of the SF-36 was significantly correlated with most symptom scores of the SCL-90-R.

CONCLUSION: HRQoL and psychological outcome were favorable in living liver transplant donors after donation. Specifically, gender, age, time since operation, recipient health condition, and employment after donation, influenced postoperative quality of life.

Key words: Health related quality of life; Psychology; Living donor liver transplantation; Donor

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INTRODUCTION

The rapid growth of living donor liver transplantation (LDLT) is attributable to the continual improvement in recipient survival and the shortage of deceased donor liver grafts[1,2]. Evidence supports a significant reduction in mortality of recipients listed for liver transplantation[3,4]. However, the donor of LDLT is exposed to risks inherent to a surgical procedure, and may suffer a considerable psychological burden[5]. Therefore, the safety of the donor operation and the health related quality of life (HRQoL) of the donor after surgery is critical while maintaining graft viability.

In the transplant center at West China Hospital of Sichuan University, liver recipient survival rates at one, three, and five years were 87.4%, 80.5% and 72.7%[6], respectively, which are similar to that reported elsewhere. Since 2001[7] over 250 cases of LDLT have been performed in our center, accounting for 30% of total transplant volume and this ratio is expected to increase in the future. However, the HRQoL and psychological outcome of donors remain unclear. The aim of the current cross-sectional study was to explore the HRQoL and the psychological outcome of donors after LDLT. To our knowledge, this is the first study of HRQoL and psychological outcome for the living liver transplant donor in mainland China. The results of the study may better guide adult-to-adult LDLT practice.

MATERIALS AND METHODS

Patients

From January 2007 to September 2010, 92 consecutive liver donors at West China Hospital of Sichuan University were approached for participation. The investigation extended from September 2010 to March 2011. Inclusion criteria were: age ⩾ 18 years, an understanding of Chinese, and greater than 6 mo recovery from surgery. Exclusion criteria were: severe medical complications and limited ability to self-express. Clinical and demographic data were collected from medical records and self-report questionnaires (completed by interview or mail).

Instruments

HRQoL was assessed using the Chinese version (2002)[8] of the Medical Outcomes Study Short Form-36 (SF-36)[9,10]. The SF-36 is a valid, self-administered questionnaire used internationally to measure 8 domains of health: physical functioning, role-physical, bodily pain, general health, vitality, social functioning, role-emotional, and mental health during the last 12 mo. The raw scores of each subscale were transformed into scores that ranged from 0 to 100, with higher scores indicating higher levels of functioning or well-being. The level of HRQoL was assessed by comparing the mean value for the study sample with the mean value for a representative sample of the general population of Sichuan province in China[11]. Scores representing overall physical functioning and mental functioning were calculated from the subscales and presented as the physical component summary scale (PCS) and mental component summary scale (MCS).

The Symptom Checklist-90-Revised (SCL-90-R)[12] is a 90-item self-report symptom inventory used to measure the psychological symptoms patterns of community, medical, and psychiatric respondents. It is a simple questionnaire that has been validated in a number of languages. The Chinese version was adapted by Wang[13]. Each of the items is rated on a five-point scale of distress ranging from "not at all" (1) to "extremely" (5). The nine primary symptom dimensions were labeled as: somatization, obsessive-compulsive behavior, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism. We assessed the level of psychological health of our sample and compared it with the Chinese norm[14].

Ethical considerations

The study protocol conformed to the ethical guidelines of the 1975 Declaration of Helsinki and was approved by the West China Hospital of Sichuan University Ethics Committee. All participants were asked to sign an informed consent form.

Statistical analysis

Statistical analysis was performed using SPSS statistical software, version 13.0. Between-group differences in HRQoL and psychological health were examined with independent sample *t* tests, analysis of variance, or nonparametric tests, as appropriate. Multiple comparisons for observed means were tested using the Student-Newman-Keuls procedure when equal variances could be assumed, and by the Games-Howell procedure when equal variances could not be assumed. Pearson correlation analysis were used to analyze the relationships between HRQoL and psychological symptoms. Statistical significance was set at $P < 0.05$.

RESULTS

Donor characteristics

Informed consents for participation were obtained from 92 donors. In the end, 71 (77.2%) validated questionnaires were returned. The results of SF-36 and SCL-90-R completed by interview or mail were not statistically different. All donors received a right hepatectomy without middle hepatic vein, and the vast majority of them reported that they would donate again. All donor relationships with liver recipient and recipient families

Table 1 Donor characteristics

Factors	Frequency	mean ± SD/percent (%)
Age (yr)		38.94 ± 10.44
≤ 40	42	59.2
> 40	29	40.8
Marital status (married/unmarried)	62/9	87.3/12.7
Gender (male/female)	40/31	56.3/43.7
Educational status		
Elementary school	15	21.1
Middle school	46	64.8
University	10	14.1
Occupation		
Worker	12	16.9
Peasant	36	50.7
Civil servant	7	9.9
Others[2]	16	22.5
Complication (yes/no)	5/66	7.0/93.0
Time since operation		
≤ 1 yr	16	22.5
> 1 yr, ≤ 2 yr	34	47.9
> 2 yr, ≤ 3 yr	21	29.6
Employment after donation		
Full-time	53	74.6
Part-time	9	12.7
No employment	9	12.7
Recipients		
Parenthood	9	12.7[1]
Children	9	12.7[1]
Couples	7	9.9[1]
Brothers and sisters	30	42.3[1]
Distant relatives	16	22.5[1]
Recipient health well-being		
Fine	56	78.9
Deterioration or death	15	21.1

[1]The sum of percentages is not equal to 100% due to rounding error; [2]Includes students, unemployed, *etc*.

were improved after donation. The demographics and clinical characteristics of the study population are shown in Table 1. The mean age of participants was 38.94 ± 10.44. Most donors were married (87.3%). More than half of the donors were male (56.3%), peasants (50.7%), and had achieved a secondary education level (64.8%). A total of 7.0% of donors experienced early or late complications including slight biliary leakage, pulmonary infection, and bodily pain. Many (47.9%) donor operations occurred 1-2 years before completing the questionnaires. Most donors worked full- or part-time after donation (87.3%). All donors were related to recipients, and most of them were close relatives (77.6%). The majority of recipients (78.9%) were in good health at the time of investigation.

HRQoL and psychological outcomes

The majority of scores on SF-36 domains did not significantly differ between donors and a representative sample (n = 1603) from the general population of Sichuan province in China (Table 2). Only scores in bodily pain (t = -2.387, P < 0.05) and social functioning (t = -2.246, P < 0.05) were significantly lower in donors compared to the general population, while the average donor physical functioning score was significantly higher than the general population (t = 2.230, P < 0.05).

Table 2 Health related quality of life after donation

SF-36 domains	Donors (71) mean ± SD	General population mean ± SD	t value	P value
Physical functioning	93.66 ± 7.26	90.80 ± 15.07	2.230	0.033
Role-physical	80.88 ± 33.18	79.51 ± 34.70	0.241	0.811
Bodily pain	71.29 ± 27.15	82.41 ± 21.25	-2.387	0.023
General health	67.33 ± 19.11	67.30 ± 21.97	0.010	0.992
Vitality	67.22 ± 18.72	71.44 ± 15.81	-1.234	0.227
Social functioning	79.69 ± 14.11	85.29 ± 18.06	-2.246	0.032
Role-emotional	76.47 ± 39.81	76.45 ± 38.47	0.003	0.998
Mental health	74.13 ± 17.12	73.52 ± 15.68	0.196	0.846

SF-36: Short Form-36.

Table 3 Psychological symptoms after donation

SCL-90-R dimensions	Donors (71) mean ± SD	Chinese norm mean ± SD	t value	P value
Somatization	1.41 ± 0.39	1.37 ± 0.48	0.600	0.553
Obsessive-compulsive behavior	1.50 ± 0.30	1.62 ± 0.58	-2.119	0.042
Interpersonal sensitivity	1.42 ± 0.32	1.65 ± 0.51	-4.183	< 0.001
Depression	1.39 ± 0.35	1.50 ± 0.59	-1.741	0.092
Anxiety	1.35 ± 0.37	1.39 ± 0.43	-0.708	0.485
Hostility	1.54 ± 0.44	1.48 ± 0.56	0.797	0.432
Phobic anxiety	1.11 ± 0.13	1.23 ± 0.41	-5.312	< 0.001
Paranoid ideation	1.25 ± 0.29	1.43 ± 0.57	-3.472	0.002
Psychoticism	1.25 ± 0.34	1.29 ± 0.42	-0.660	0.514

SCL-90-R: Symptom Checklist-90-Revised.

The average SCL-90-R scores of the general population were significantly greater than average donor scores in the areas of obsessive-compulsive behavior (t = -2.119, P < 0.05), interpersonal sensitivity (t = -4.183, P < 0.001), phobic anxiety (t = -5.312, P < 0.001), and paranoid ideation (t = -3.472, P < 0.01) (Table 3). These results indicate that the psychological well-being of liver transplant donors was higher than the general population in these dimensions.

Analysis of HRQoL

The general health domain of the SF-36, was significantly lower for female donors compared to male donors (t = 2.661, P < 0.05). Donors more than 40 years old scored higher in social functioning (t = 2.269, P < 0.05) and mental health (t = 2.184, P < 0.05). Donors who underwent surgery more than two years before the current study scored highest in physical functioning (F = 9.394, P = 0.001) and bodily pain (F = 3.513, P < 0.05), while those undergoing surgery less than one year prior to the study scored lowest. Quality of life differed significantly depending on donor employment status. Donors with full-time employment scored highest in role-physical (F = 5.790, P = 0.005), vitality (F = 9.018, P = 0.001), social functioning (F = 4.786, P < 0.05) and mental health (F = 11.051, P < 0.001). Interestingly, recipient health condi-

Table 4 Donor health related quality of life

Factors SF-36 domains	Groups mean ± SD	Groups mean ± SD	Groups mean ± SD	*t*/*F* value	*P* value
Gender	Male	Female			
General health	75.83 ± 22.09	59.78 ± 12.25		t = 2.661	0.012
Age (yr)	≤ 40	> 40			
Social functioning	75.00 ± 12.13	85.71 ± 14.59		t = 2.269	0.031
Mental health	68.89 ± 12.98	82.61 ± 20.00		t = 2.184	0.038
Time since operation (yr)	≤ 1	> 1, ≤ 2	> 2, ≤ 3		
Physical functioning	82.50 ± 2.89	94.42 ± 6.66[1]	98.33 ± 2.58[1]	F = 9.394	0.001
Bodily pain	52.67 ± 24.35	70.91 ± 27.57[2]	91.33 ± 13.43[1,2]	F = 3.513	0.042
Employment after donation	Full-time	Part-time	No employment		
Role-physical	93.64 ± 6.93	76.67 ± 12.91[3]	75.00 ± 22.36[3]	F = 5.790	0.005
General health	69.45 ± 18.01[4]	76.22 ± 18.54[4]	50.67 ± 16.03	F = 3.538	0.041
Vitality	74.24 ± 15.52	46.67 ± 8.12[3]	48.33 ± 14.38[3]	F = 9.018	0.001
Social functioning	84.09 ± 12.31	75.00 ± 14.43	66.67 ± 12.91[3]	F = 4.786	0.016
Mental health	81.82 ± 11.89	52.00 ± 5.24[3]	53.33 ± 11.50[3]	F = 18.137	< 0.001
PCS	58.51 ± 5.31	52.31 ± 5.01[3,4]	43.59 ± 5.52[3]	F = 11.051	< 0.001
MCS	54.31 ± 6.00	44.56 ± 3.42[3,4]	34.92 ± 2.66[3]	F = 32.748	< 0.001
Recipient health well-being	Well	Poor or death			
General health	71.57 ± 19.10	55.42 ± 9.03		t = 2.121	0.042
Social functioning	82.69 ± 11.77	66.67 ± 17.08		t = 2.763	0.010
Role-emotional	87.18 ± 31.38	41.67 ± 46.29		t = 2.603	0.028

Only statistically significant data are displayed. [1]Compared with group "≤ 1 yr", $P < 0.05$; [2]Compared with group "> 1, ≤ 2 yr", $P < 0.05$; [3]Compared with group "Full-time", $P < 0.05$; [4]Compared with group "No employment", $P < 0.05$. SF-36: Short Form-36; PCS: Physical component summary scale; MCS: Mental component summary scale.

Table 5 Correlation analysis between health related quality of life and psychological symptoms

SCL-90-R dimensions	SF-36			
	PCS		MCS	
	r value	*P* value	*r* value	*P* value
Somatization	0.200	0.290	-0.246	0.190
Obsessive-compulsive behavior	0.173	0.362	-0.421	0.020
Interpersonal sensitivity	-0.067	0.726	-0.545	0.002
Depression	-0.306	0.114	-0.557	0.002
Anxiety	-0.222	0.238	-0.393	0.032
Hostility	-0.335	0.071	-0.456	0.011
Phobic anxiety	0.118	0.535	-0.201	0.266
Paranoid ideation	0.035	0.853	-0.157	0.407
Psychoticism	0.028	0.881	-0.209	0.267

SCL-90-R: Symptom Checklist-90-Revised; SF-36: Short Form-36; PCS: Physical component summary scale; MCS: Mental component summary scale.

tion also influenced donor general health (t = 2.121, P < 0.05), social functioning (t = 2.763, P = 0.010), and role-emotional (t = 2.603, P < 0.05) (Table 4). Marital status, educational status, categories of occupation, complications, or donor-recipient relationship did not significantly affect quality of life.

To reduce the number of outcome variables regarding HRQoL, outcomes among donors were also compared using the PCS and the MCS of the SF-36. PCS (F = 11.051, P < 0.001) and MCS (F = 32.748, P < 0.001) scores were highest in donors with full-time employment and lowest in unemployed donors (Table 4). Other demographic and clinical factors did not affect PCS or MCS scores.

Table 5 presents the correlation coefficients between PCS and MCS scores of the SF-36 and the scores on the SCL-90-R subscales. MCS scores were significantly (all P < 0.05) correlated with obsessive-compulsive behavior (r = -0.421), interpersonal sensitivity (r = -0.545), depression (r = -0.557), anxiety (r = -0.393), and hostility (r = -0.456). There were no significant correlations between PCS scores and SCL-90-R scores.

DISCUSSION

Overall, donors reported a positive experience. The vast majority of donors stated that they would donate again, and almost all believed they had benefited from the donation. All donors were able to return to their (pre-donation) job a few months after donation (while some donors chose to quit their previous job). There were few significant differences in quality of life domains between the donors in the current study and the general population. Interestingly, donors reported a higher level of physical functioning than the general population. This observation has been previously described[15-17].

Female donors scored lower than male donors in the general health domain of the SF-36. This difference may be due to social and psychological factors[18,19]. The rates of psychological distress and physical illness are higher in women probably due to gender roles. Gove[20] points out that the highly structured roles of men tend to be causally linked to good mental health and low rates of morbidity, while the typical nurturing roles of women tend to be associated with a high level of social demand and lack of privacy. Furthermore, occupying a nurturing role impairs one's ability to effectively adopt a patient role[20].

Employment status, a measurement indicative of the

donor's ability to resume societal roles, was significantly related to quality of life. Previous research[21,22] has found that employed liver recipients reported better HRQoL than those unemployed after liver transplantation. However, the relationship between employment and HRQoL of donors remains elusive. While previous research[23,24] reported that most donors are able to return to pre-donation employment status within a few months, the direct relationship between employment status and HRQoL was not detailed until the current study.

Other factors impacting the quality of life included age of donor and time since operation. Older donors reported a significantly higher quality of life in domains such as social functioning and mental health. In addition, quality of life of donors more than one year after surgery was greater than that of donors who had undergone surgery during the previous time. These results suggest that HRQoL recovers with time post operation. In agreement, a study by Chan *et al*[25] found that donor quality of life, particularly the physical component, was most significantly affected during the first three postoperative months while physical and mental quality of life returned to pre-operation levels by a 6 to 12 mo period.

Despite previous reports[15,17] showing no relationship between recipient outcome and donor quality of life, the current study found that recipient well-being was an important factor influencing donor quality of life. The donors in the present study were all genetically and emotionally related to recipients. Throughout the donation process, donors were strongly concerned about the recipients. These emotional ties resulted in a strengthening of the relationships between donors and recipients and their families.

The resection of the right hepatic lobe is a safe operation and resulted in a good psychological outcome for most donors, irrespective of donation-related potential risks. The majority of donors were not anxious, did not feel coerced, and did not consider donation dangerous prior to the operation. Some donors reported excitement in facing a new experience and some said they could handle any consequences of the surgery. Only a few donors reported being anxious, being unsure about the operation, and experiencing increased stress prior to the operation. Some donors verbalized feelings of gratefulness and increased maturity post surgery. Most aspects of donor mental quality of life were significantly related to psychological symptoms. These results indicate the necessity of providing support to donors who experience negative feelings.

In conclusion, LDLT donors were healthy and the overall quality of life and psychological outcome were favorable. Employment after donation is an important factor significantly related to quality of life. Gender, age of donor, time since operation, and recipient health were all found to influence aspects of the quality of life of donors. Right hepatectomy is an acceptable procedure, with encouraging donor outcomes. Donor HRQoL and psychological status should continue to be monitored.

The current study has limitations that should be addressed. The data were collected at a single transplant center and the study design was a cross-sectional analysis which can be less informative than a longitudinal analysis. Nevertheless, the present study yielded important preliminary findings in mainland China. Longer follow-up periods and prospective studies will be necessary to identify long-term quality of life and psychosocial consequences of adult LDLT donors.

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COMMENTS

Background

Living-donor liver transplantation (LDLT) is an effective treatment for end-stage liver disease in selected recipients, especially in Asian countries where the cadaveric graft supply is markedly limited. The graft and recipient survival rates are excellent and equivalent to those after deceased-donor liver transplantation. However, the donor of LDLT is exposed to risks inherent to a surgical procedure, and may suffer a considerable psychological burden. Therefore, the safety of the donor operation and the health related quality of life (HRQoL) of the donor after surgery is critical while maintaining graft viability.

Research frontiers

Currently, Not much researches about HRQoL and psychological well-being of the living liver donors have been reported after LDLT. There is a lack of comprehensive and systemic assessment data on donors' HRQoL and psychological well-being after LDLT. So the present study evaluated the HRQoL and psychological well-being on the LDLT donors and identified some potential factors affecting their HRQoL.

Innovations and breakthroughs

This article is one of the few literatures on the quality of life and psychological well-being of the living liver donors after LDLT. The study is well constructed and well planned, and is a comprehensive and systemic assessment data on donors' HRQoL and psychological well-being after LDLT.

Applications

The present study yielded important preliminary findings on reseaches of the donors' quality of life and psychological well-being. The findings will have a significant impact on future clinical strategies.

Terminology

LDLT is a procedure in which a living person donates a portion of his or her liver to another. HRQoL is a multi-dimensional concept that includes domains related to physical, mental, emotional and social functioning.

Peer review

This is a good study contributing to this important area of liver transplantation. The authors have shown that the right donor hepatectomy is an acceptable procedure.

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