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ORIGINAL ARTICLE

Salvage liver transplantation for hepatocellular carcinoma recurrence after primary liver resection



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Summary

Objective: To evaluate the clinical efficacy and prognostic factors for salvage liver transplantation (SLT) for hepatocellular carcinoma (HCC) recurrence after primary liver resection.

Methods: One hundred and eleven patients underwent SLT for HCC recurrence after primary liver resection from April 2000 to June 2011. We analyzed statistically the operative characteristics, survival rate, and effect of pathological characteristics on prognosis of SLT.

Results: The overall survival rates at 6 months, and 1, 3 and 5 years after SLT were 87.9%, 75.5%, 56.3% and 49.1%, respectively. The mean age of the patients receiving SLT was 53.5 ± 9.6 years (range: 26.8–76.4 years), with a median follow-up of 28.8 months. The mean operating time was 10.34 ± 3.05 hours, and mean blood loss was 2925.0 ± 2373.51 ml. However, factors such as Edmondson grade, TNM stage, and invasion of hepatic and portal veins significantly affected the prognosis of SLT.

Conclusions: SLT for HCC recurrence after primary liver resection does not show increased surgery-related risks or reduced long-term survival rate, and thus SLT is an effective treatment for patients with HCC recurrence after primary liver resection.

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Introduction

Hepatocellular carcinoma (HCC) that meets the Milan or University of California, San Francisco (UCSF) criteria is a reasonable indication for liver transplantation, and has a 5-year survival rate higher than 70% [1]. The current organ shortage, however, makes it impossible to satisfy all the

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patients with HCC on the waiting list. Patients diagnosed with HCC in the compensatory phase of liver function can undergo primary liver resection as a first-stage treatment, so as to prolong the waiting time for liver transplantation. Due to the invasive and metastatic nature of HCC, recurrence is still the main problem after liver resection. Patients with intrahepatic recurrence should be given an accurate assessment, and considered for salvage LT (SLT). The indications and selection criteria for SLT are still controversial, and there is no sufficient demonstration about the surgical risk [2–5]. In our study, we analyzed 111 patients who received SLT, including operative characteristics, survival rate, and prognostic factors, and we also evaluated the feasibility of SLT retrospectively.

Patients and methods

Ethics statement

This study was verified and approved by Beijing Friendship Hospital Ethics Committee. All clinical investigation was conducted according to the principles expressed in the Declaration of Helsinki. All patients were informed about the surgical risks before the operation, and gave signed informed consent. All consent documents were stored in the hospital database and are available upon request. All data are accessible at China Liver Transplant Registry (www.cltr.org/en/).

Patients

From April 2000 to June 2011, 111 patients (103 male and 8 female) underwent SLT for HCC recurrence after primary liver resection (SLT group). In the SLT group, the average age was 53.5 ± 9.6 years (range: 26.8–76.4 years), and median follow-up time was 28.8 months. One hundred and one patients had primary liver resection once, and the other 10 patients had the operation twice. Twenty-four patients met the Milan criteria, 83 were beyond the Milan criteria, and the other 4 had missing data. Eighty-six patients had hepatitis B, 15 patients had hepatitis C, 3 had hepatitis B and C, and 7 had no hepatitis. One hundred and eight patients received whole-graft orthotopic LT, 2 received split liver transplantation, and the other underwent living donor LT (Table 1).

Database

For this retrospective study, we collected the following data about the SLT group. Intraoperative data: operating time and blood loss; pathological data: number of tumors, size of tumors, Milan criteria, hepatic vein invasion, branch portal vein tumor thrombus, tumor capsule, satellite lesions, portal vein tumor thrombus, celiac lymph nodes, infringement of hilar lymph nodes, TNM stage, and new Edmondson grade; follow-up data: survival status, and cause of death.

Statistics

The clinical data were analyzed retrospectively. For descriptive data such as SLT operation time and bleeding volume,

Table 1 Variables of salvage liver transplantation (SLT) group.

	SLT group (n = 111)	
Age (years)	53.5 ± 9.6	
Sex		
Male	103	(92.79%)
Female	8	(7.21%)
Milan criteria		
Within	24	(21.62%)
Beyond	83	(74.77%)
Missing	4	(3.60%)
Hepatitis		
B	86	(77.48%)
C	15	(13.51%)
B + C	3	(2.70%)
None	7	(6.31%)
Graft type		
LDLT	1	(0.90%)
Split LT	2	(1.80%)
OLT	108	(97.30%)
Liver resection		
Once	101	(90.99%)
Twice	10	(9.01%)
Median follow-up (months)	28.84	

LDLT: living donor liver transplantation; OLT: orthotopic liver transplantation.

independent samples *t*-test was used. Kaplan–Meier survival analysis and log-rank test were used for comparing the survival rate among primary liver transplantation (PLT) and SLT groups. Single factor analysis was used for the prognostic factors in the SLT group.

Results

Survival analysis

The cumulative survival rate after SLT for HCC recurrence after primary liver resection was 87.9%, 75.5%, 56.3% and 49.1% at 6 months, 1 year, 3 years and 5 years, respectively (Fig. 1).

Operating time and bleeding volume

In the SLT group, the mean operating time was 10.34 ± 3.05 hours, and the mean volume of bleeding was 2925 ± 2373.51 ml, with 11 patients having a volume ≥ 5000 ml. There were 7 patients with no transfusion of red blood cells.

Prognostic factors for SLT

We analyzed variation in new Edmondson grade, hepatic vein invasion, portal vein invasion, and Milan criteria, to evaluate the prognostic factors and therapeutic efficacy in the SLT group. The results suggest that there was no significant difference between types of hepatitis, presence of a tumor capsule, satellite lesions, hilar lymph node metastasis, or

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