Liver resection for hepatocellular carcinoma: results from 150 consecutive patients

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Summary. During the past 6 years, 150 consecutive hepatic resections were performed for hepatocellular carcinoma on 129 male and 21 female patients. Their ages ranged from 17 years to 78 years, with an average of 57.0 years. All but two patients had an underlying parenchymal disease of the liver; 131 had liver cirrhosis, 16 chronic hepatitis, and one liver fibrosis. The operations performed were extended right lobectomy in 10 cases, right lobectomy in 13, left lobectomy in 5, left lateral segmentectomy in 11, other segmentectomies in 31, and partial wedge resection in 80 instances. The operative and in-hospital mortality rates were 6.0% and 12.0% respectively. In the 122 patients with curative resection, the 1-, 3- and 5-year survival rates were 75.2%, 49.0% and 30.0% respectively. The 1- and 3-year survival rates were 14.3% and 7.1% in the 28 patients with palliative resection. The tumor size and Child's classification generally reflected the survival rate.

Introduction

Hepatocellular carcinoma (HCC) is a tumor commonly found in Oriental countries, including Japan. It is one of the most malignant tumors and its prognosis is usually poor, if untreated [11]. Through the advance of chemotherapy and technical devices, such as embolization of the hepatic artery, the survival time of HCC patients has recently been prolonged [5, 19, 20]. However, the most reliable and definitive treatment for this tumor is hepatic resection.

The incidence of relatively small HCC has increased because of earlier diagnosis by measurement of serum α-fetoprotein, ultrasonography, or computed tomography. Therefore, the resectability of HCC, even in the presence of associated cirrhosis, has apparently increased in recent years. Here we report our results of hepatic resection in 150 consecutive patients with HCC.

Materials and methods

During the past six years, hepatic resection was performed on 129 male and 21 female patients with primary hepatocellular carcinoma (HCC). Their ages ranged from 17 years to 78 years with an average of 57.0 years.

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Underlying liver diseases. Liver cirrhosis is defined as a widespread hepatic fibrosis with nodule formation (pseudolobules). The involvement of the major part of the liver and the presence of fibrosis and nodules are all essential for a diagnosis of cirrhosis [1]. All but two patients had an underlying parenchymal disease of the liver; 131 had liver cirrhosis (87.3%), 16 had chronic hepatitis (10.7%), and one liver fibrosis (0.7%).

Preoperative associated conditions. There were 85 associated conditions in 76 patients. The most common complications were esophageal varices, diabetes mellitus, cholelithiasis, and peptic ulcer. Concomitant malignancy was present in two patients (Table 1).

Operative methods. The methods of hepatic resection are described in detail elsewhere [12, 13, 15–17]. The operations performed comprised extended right lobectomy in 10, right lobectomy in 13, left lobectomy in 5, left lateral segmentectomy in 11, other segmentectomies in 31, and partial wedge resection in 80 cases. Portal tumor thrombectomy was performed on four patients in combination with hepatic lobectomy. In the treatment of the associated conditions 36 operations were carried out simultaneously with hepatic resection (Table 2). A distal splenorenal shunt was performed according to either the original Warren shunt [21] or our modifications [14].

Curability of hepatic resection. Hepatectomies were palliative in seven patients; four were due to multiple intrahepatic metastases, two to extensive lymphnode metastases

Table 1. Preoperative associated conditions

Conditions	No. of cases	(%)
Esophageal varices	31	20.7
Diabetes mellitus	27	18.0
Cholelithiasis	14	9.3
Peptic ulcer	6	4.0
Severe hypersplenism	1	0.7
Gastric cancer	1	
Malignant lymphoma	1	
Submucosal tumor of the stomach	1	
Atelectasis	1	
Pneumoconiosis	1	
Cerebral infarction	1	

Table 2. Simultaneous operations

Operative methods	No. of cases
Distal splenorenal shunt	12
Splenectomy	5
Coronary vein ligation	5
Hassab's operation	1
Cardiectomy	1
Cholecystectomy	9
Vagotomy	2
Partial gastrectomy	1
Fenestration of liver cyst	1
Total	36

Table 4. Operative and in-hospital mortalities

Causes	No. of cases	(%)
Operative death within 1 month		
Liver failure	5	3.3
Coagulopathy	2	1.3
Varix bleeding	1	0.7
Pneumonia	1	0.7
Total	9	6.0
In-hospital death after 1 month		
Liver failure	6	4.0
Portal thrombosis	1	0.7
Renal failure	1	0.7
Cancer death	1	0.7
Total	9	6.0
Total	18	12.0

in the retroperitoneum, and one to multiple omental metastases. Only primary tumors were resected in these cases. Postoperative examinations by serum α-fetoprotein measurements, ultrasonography, computed tomography and, if necessary, angiography just before discharge from the hospital, demonstrated residual tumors in the liver remnants in 21 patients. Thus, 28 patients were considered to have undergone palliative hepatic resections. The remaining 122 underwent a curative resection.

Postoperative follow-up. Conventional liver tests and α-fetoprotein measurements were serially performed after the operation. Before discharge from the hospital, radiological imaging by ultrasonography and computed tomography were performed routinely. Patency of the shunt was confirmed in all patients with a distal splenorenal shunt. After discharge from the hospital, the patients were followed up at 2-week intervals during the first 6 months and monthly thereafter. Imaging diagnosis was repeated every 3 months. When tumor recurrence was suspected, the patients was hospitalized for angiography.

Results

Postoperative morbidity and mortality.

Forty-three complications were encountered in 37 patients, 35 of whom had underlying cirrhosis of the liver. Acute liver failure occurred in five patients, all of whom

Table 3. Postoperative complications

Complications	No. of cases	(%)
Liver failure	13	8.7
Upper gastrointestinal bleeding	8	5.3
Rebleeding	5	3.3
Biliary fistula	5	
Coagulopathy	2	1.3
Leakage of colonic anastomosis	2	
Pneumonia	2	
Varix bleeding	1	0.7
Portal thrombosis	1	
Subphrenic abscess	1	
Hemothorax	1	
Atelectasis	1	
ARDS[a]	1	
Total	43/37 cases	

[a] Adult respiratory distress syndrome

died in a hepatic coma within 1 month after operation. Eight more patients had insidious postresectional hepatic failure with steady elevation of serum bilirubin levels. Six of them finally died in a coma between 1 month and 3 months after operation. Upper gastrointestinal bleeding occurred in the first two weeks; seven cases from acute mucosal lesion of the stomach or duodenum and one from rupture of esophageal varices. Postoperative rebleeding was seen in five patients; four from the resectional margin and one from the diaphragm. Hemostasis was achieved by immediate relaparotomy in all patients, but fatal hepatic failure subsequently occurred in two. A massive intraoperative hemorrhage caused coagulopathy in two patients. The first patient died of continuous bleeding the next day. The other had adult respiratory distress syndrome, which was successfully treated by mechanical ventilation and methyl prednisolone. Five biliary fistulas spontaneously subsided 4–8 weeks after operation. Autopsy findings revealed an organized portal vein thrombosis in a patient who died of liver failure 2 months after extended right lobectomy (Table 3). Nine patients died within 1 month during the first admission. Thus the operative and in-hospital mortality rates were 6.0% and 12.0% respectively (Table 4).

Results of additional operations

One patient died from rupture of esophageal varices 10 days after the Warren shunt, probably as a result of thrombosis of the shunt. Variceal bleeding was prevented in the remining 11 cases. None of the patients with various other operations had postoperative morbidity related to the procedures.

Survival

Of the 122 patients who had undergone curative hepatic resection, 68 are still alive and 39 died after discharge. Fifty-five are free of cancer, and 13 show evidence of tumor recurrence. The causes of late death were cancer in 20 cases, liver failure in 14, hepatitis in two, gastrointestinal bleeding in one, variceal bleeding in one, and sepsis in one. On the other hand, 23 of the 28 patients with palliative resection died after discharge from the hospital. Only two were alive at the time of writing. Fig. 1 shows the cumulative survival rates in patients with curative and palliative hepatic resections. The rates in the former group were
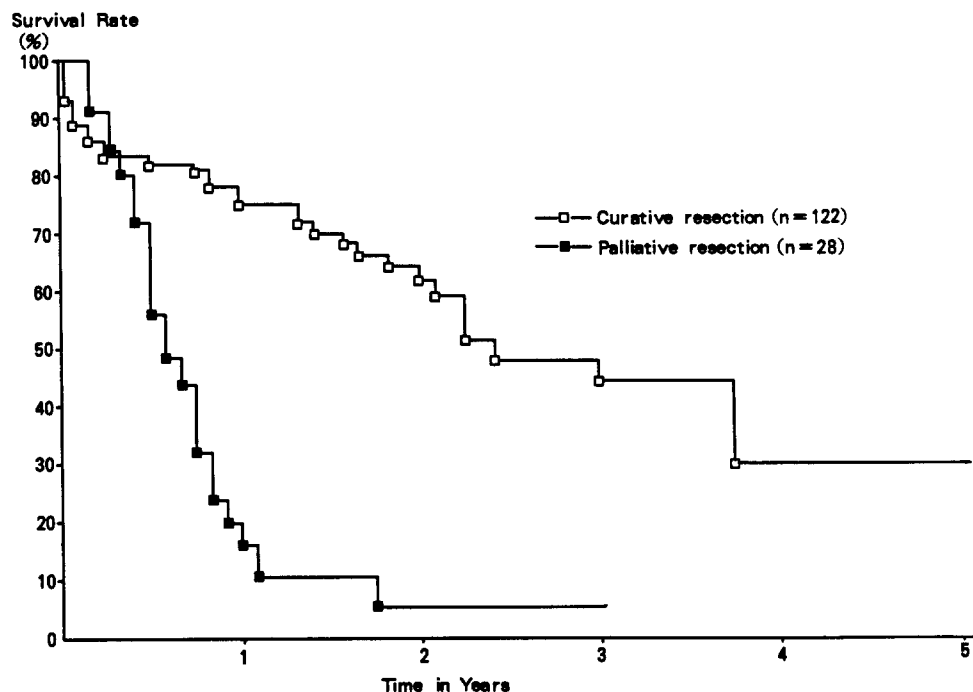
Survival Rate
(%)

Fig. 1. Cumulative survival curves in patients with curative and palliative hepatic resections

75.2% after 1 year, 49.0% after 3 years, and 30.0% after 5 years. The 1- and 3-year survival rates were 14.3% and 7.1% in the latter group. Among curative resection patients, the survival rate was significantly better in those without cirrhosis than in cirrhotic patients. The 1-, 3-, and 5-year survival rates in these two groups were 80.1% and 73.2%, 80.1% and 41.3%, and 80.1% and 21.2% respectively (Fig. 2). A contrary trend was found in those with palliative resections (Fig. 3). Child's classification reflected the survival rate well only during the first 3 years (Fig. 4). In Fig. 5 is shown the survival rate in patients undergoing cu-

rative resection for solitary HCCs associated with liver cirrhosis. The survival was relatively well correlated with the tumor size.

Discussion

The resectability rate of primary liver cancer varies widely, but is usually around 10%, ranging from 7.3% to 35.6% [2, 4, 7, 10]. Hepatic resection was performed on 150 of the 231 patients with HCC in our series. There might be several reasons for the high resectability rate (64.9% for all resections and 52.8% for only curative resections) in the pre-
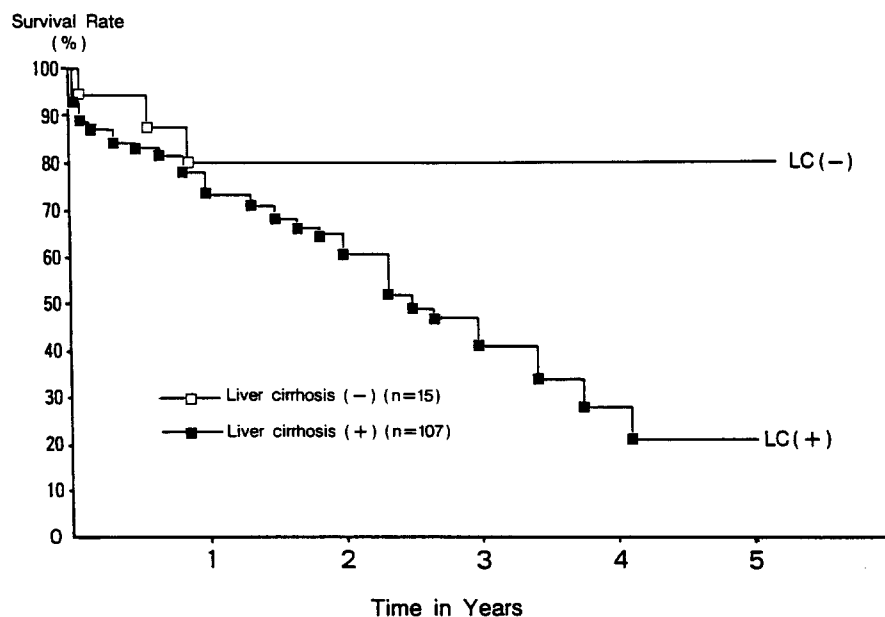

Fig. 2. Cumulative survival curves after curative hepatic resection in patients with and without associated liver cirrhosis
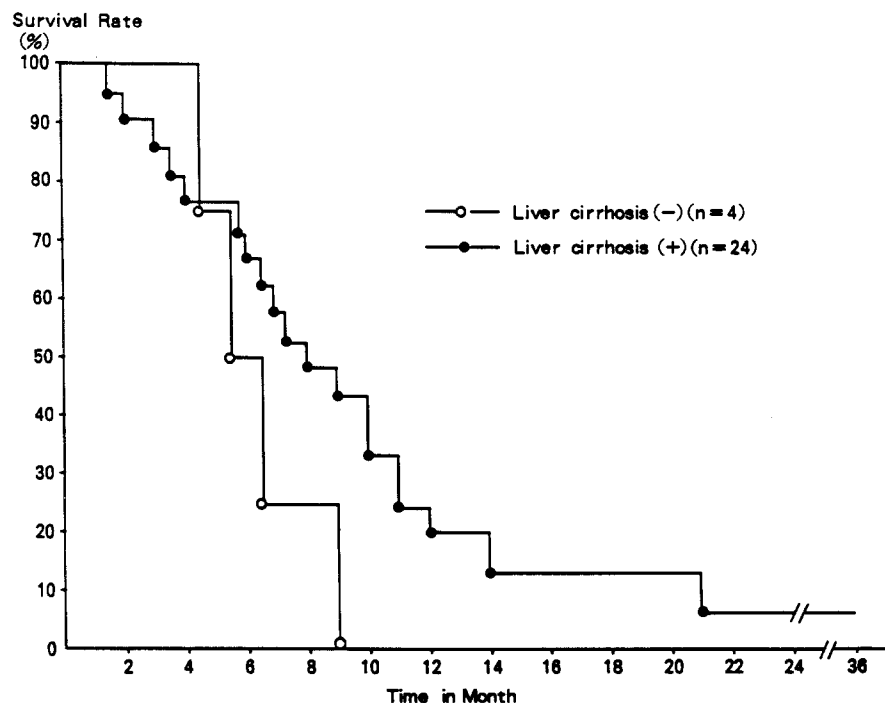
Survival Rate
(%)

Fig. 3. Cumulative survival curves after palliative hepatic resection

sent series. The first and most important reason may be that our series contains many cases of relatively small HCCs, and secondly, we took an aggressive attitude in the treatment of HCC. Although we did not select the patients at the outpatient clinic, we did not prevent some selection, because most of our patients were referred from other hospitals.

There was an operative mortality rate of 6.0% within 1 month, and the overall in-hospital mortality rate was 12.0%. The oprative mortality rate of patients with HCC quoted in the literature varies from 13% to 33% [2, 3, 8, 9].

A worldwide review by Curutchet et al. [4] found that only 45 patients survived for more than 5 years after liver resection for HCC. Fortner et al. [6] have reported a 3-year survival rate of 88% in patients with curative resection. Bengmark et al. [2] had a 4-year survival rate of 22% in their series with both curative and palliative resections. In the present series, the 5-year survival rates were 80.1% in patients without and 21.2% with cirrhosis after curative resection. The overall survival rate was 30.0%. On the other hand, 26 of the 28 patients with palliative resection died within 2 years. The 3-year survival rate was only 7.1%. With such
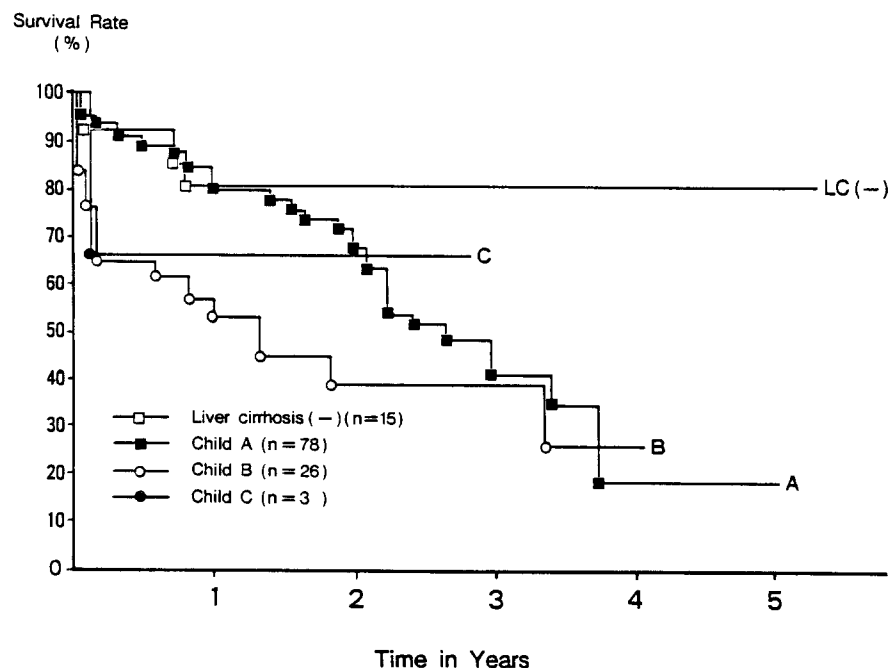
Survival Rate
(%)

Fig. 4. Cumulative survival curves after curative hepatic resection according to Child's classification
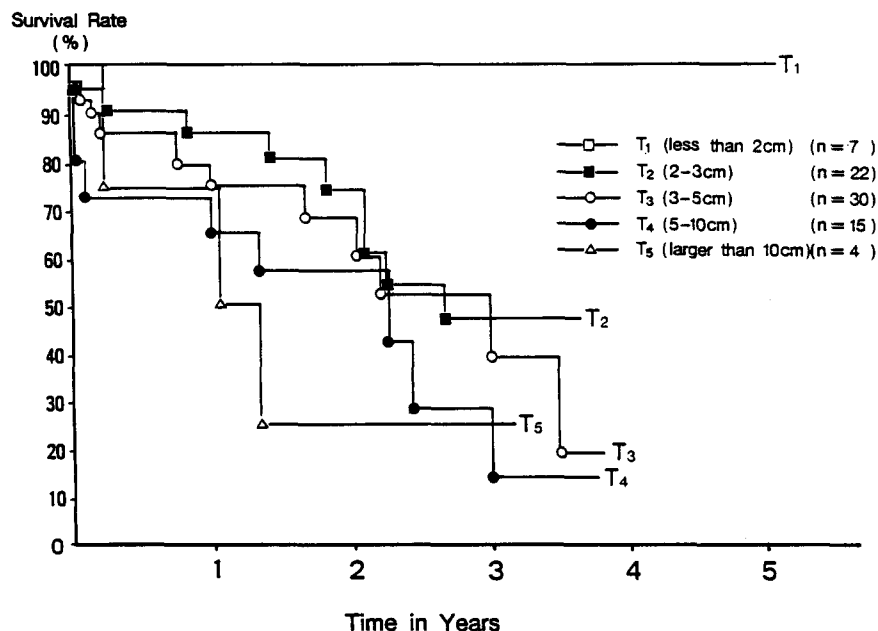
Survival Rate
(%)

Fig. 5. Cumulative survival curves after curative hepatic resection in patients with solitary HCC and liver cirrhosis, according to tumor size.

results, we assume at present that palliative hepatic resection is meaningless in the treatment of HCC.

The present series is different from those of Europe or North America in several respects. First, 87% of our patients had underlying cirrhosis of the liver. Second, the proportion of small HCCs was higher in our series than in the other reports. Third, 36 operations for associated conditions, such as esophageal varices, cholelithiasis or peptic ulcer, were safely carried out simultaneously with hepatic resection. Our current results show that a curative resection is possible even in the presence of advanced cirrhosis, provided that the tumor is discovered at a preclinical stage. Also, a satisfactory long-term survival can be achieved by atypical small hepatic resection for small HCCs associated with cirrhosis [18].

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