

## Surgery for Gastric Cancer in Patients with Cirrhosis

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**Abstract:** To clarify the therapeutic strategies for gastric cancer surgery in the presence of cirrhosis, 39 patients with gastric cancer accompanied by liver cirrhosis were reviewed. Severe postoperative complications developed in 10 patients (25.6%), and there were 4 (10.3%) hospital deaths, 1 (2.6%) of which occurred within 1 month. Although extended lymph node dissection of D<sub>2</sub> or more was adopted for low-risk patients, 3 of 19 patients who underwent such extensive operations, most of which involved complete lymph node dissection in the hepatoduodenal ligament, died. Conversely, only 1 of 20 patients who underwent limited lymph node dissection of D<sub>1</sub> or less died. Postoperative massive ascites developed in 6 patients, 3 of whom died. The cumulative 5-year survival rate following curative resection was 63.7% for patients with early gastric cancer, and 13.9% for those with advanced gastric cancer. The most frequent cause of death was cirrhosis-related, such as hepatic failure or hepatoma. In conclusion, extensive lymph node dissection for patients with gastric cancer accompanied by cirrhosis carried a risk of postoperative fatal massive ascites as lymphorrhea. Thus, lymph node dissection in the hepatoduodenal ligament should be avoided, except in patients with evident metastases, and as a rule, aggressive surgery should not be performed in cirrhotic patients.

**Key Words:** gastric cancer, liver cirrhosis, postoperative complications, lymph node dissection

### Introduction

In the surgical treatment of gastric cancer, extended gastric resection with radical lymph node dissection is important for curative resection to be achieved.<sup>1</sup> However, for patients with liver cirrhosis, the therapeutic strategy for gastric cancer is controversial, as cirrhosis itself is considered to be a terminal stage of liver dis-

ease, and surgery in such patients can cause a number of postoperative complication.<sup>2-6</sup> In a previous study,<sup>7</sup> we reported that the risk factors related to a high incidence of severe postoperative complications in cirrhotic patients were Child's type C disease, a preoperative serum GOT over 80 U/l, bilirubin over 1.1 mg/dl, albumin below 3.0 g/dl, and an indocyanine green retention test (ICG R<sub>15</sub>) over 35%. Subsequently, we have since performed operations with limited radicality for patients with these risk factors, and while the incidence of postoperative complications has been reduced, they have still developed in some patients. In the present study, we reviewed a number of patients with liver cirrhosis undergoing surgery for gastric cancer, and investigated the early postoperative morbidity and mortality with special reference to lymph node dissection, and the long-term outcome of these patients.

### Patients and Methods

A total of 39 patients with liver cirrhosis who underwent curative surgery for gastric cancer at the Department of Surgery, Osaka Medical College, between August 1978, and December 1994, were reviewed. These patients consisted of 31 men with an average age of 61.6 years and 8 women with an average age of 60.6 years. There were 28 patients with early gastric cancer in which the cancer invasion was limited to within the submucosal layer, and 11 patients with advanced gastric cancer in which the cancer had invaded beyond the proper muscle layer. Postoperative complications, hospital mortality, and long-term results were analyzed in all 39 patients. The types of gastric resection were distal gastrectomy in 34 patients, total gastrectomy in 3 patients, proximal gastrectomy in 1 patient, and local resection of the gastric wall in 1 patient.

The degree of lymph node dissection was performed according to the *Japanese Classification of Gastric Car-*

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(Received for publication on Oct. 4, 1995; accepted on May 10, 1996)

cinoma;<sup>8</sup> D<sub>1</sub> being limited lymph node dissection in which the perigastric lymph nodes are removed; and D<sub>2</sub> being extended lymph node dissection in which, in addition to D<sub>1</sub>, the lymph nodes along the common hepatic artery, along the splenic artery, and around the celiac axis are removed. D<sub>2</sub> or more extensive lymph node dissection was performed in 30.4% of the 23 patients with early gastric cancer and in 75% of the 16 patients with advanced gastric cancer. According to Child's classification,<sup>9</sup> D<sub>2</sub> or more lymph node dissection was performed in 61.5% of the patients with Child's type A disease, in 50.0% of those with Child's type B disease, patients, and in 16.7% of those with Child's type C disease.

Concerning the dissection of lymph nodes in the hepatoduodenal ligament, the degree of lymph node dissection was divided into three groups: the no dissection group; the incomplete dissection group, in which lymph nodes were dissected in part; and the complete dissection group. In the 20 patients who underwent D<sub>1</sub> dissection or less, the lymph nodes in the hepatoduodenal ligament were not dissected in 15 patients, dissected incompletely in 4 patients, and dissected completely in 1 patient. In the 19 patients who underwent D<sub>2</sub> dissection or more, the lymph nodes in the hepatoduodenal ligament were not dissected in 2 patients, dissected incompletely in 4 patients, and dissected completely in 13 patients.

Aggressive lymph node dissection tended to be adopted between 1978 and 1988,<sup>7</sup> and then more limited lymph node dissection was practiced between 1989 and 1994, in this series. Hospital mortality was defined as all hospital deaths related to the operation, and curative resection was defined as resection with no apparent residual tumors.

Statistical analysis was performed by the chi-squared test or the Fisher's direct test for the comparison of two items. Survival curves were calculated by the Kaplan-Meier method and compared by the generalized Wilcoxon test.

## Results

Postoperative complications developed in 25 (64.1%) of the 39 patients. Severe complications, including

**Table 1.** Postoperative complications and mortality of the gastric cancer patients with liver cirrhosis according to Child's classification

Child's classification	No. of patients	Severe complications	Hospital deaths
Child's A	13	3 (23.1%)	1 (4.3%)
Child's B	20	4 (20.0%)	2 (10.0%)
Child's C	6	3 (50.0%)	1 (16.7%)

uncontrollable ascites, organ failure, or intraabdominal or intestinal bleeding of more than 1000ml, developed in 10 of these patients (25.6%), resulting in four (10.3%) hospital deaths, Death within 1 month, defined as operative mortality, occurred in one patient (2.6%). No anastomotic leakage developed in any of the patients.

### Severe Postoperative Complications, Hospital Death, and Child's Classification

Severe complications developed in 23.1% of the patients with Child's type A disease, 20.0% of those with Child's type B disease, and 50.0% of those with Child's type C disease. Hospital deaths occurred in 1, 2, and 1 of the patients with Child's type A, B, and C disease, respectively (Table 1).

### Severe Postoperative Complications, Hospital Mortality, and Lymph Node Dissection

Severe complications developed in 30% of the patients who underwent D<sub>1</sub> or less lymph node dissection, and 21.1% of those who underwent D<sub>2</sub> or more lymph node dissection. Although only 1 patient (5%) died in the former group, 3 patients (15.8%) died in the latter group (Table 2).

Table 3 demonstrates the relationship between lymph node dissection in the hepatoduodenal ligament and the mortality of patients. The postoperative complication rates were similar among the no dissection group, the incomplete dissection group, and the complete dissection group; however, 3 of the 14 patients who underwent complete dissection died of postoperative complications, yielding a 21.4% mortality rate in the complete dissection group.

**Table 2.** Postoperative complications and mortality of the gastric cancer patients with liver cirrhosis in relation to lymph node dissection

Lymph node dissection	No. of patients	Severe complications	Hospital deaths
D <sub>1</sub> or less	20	6 (30.0%)	1 (5.0%)
D <sub>2</sub> or more	19	4 (21.1%)	3 (15.8%)

}  $P = 0.28$

**Table 3.** Postoperative complications and mortality of gastric cancer patients with liver cirrhosis in relation to the dissection of lymph nodes in the hepatoduodenal ligament

Dissection of lymph nodes in the hepatoduodenal ligament	No. of patients	Severe complications	Hospital deaths
No dissection	17	4 (23.5%)	1 (5.9%)
Incomplete dissection	8	2 (25.0%)	0 (0%)
Complete dissection	14	4 (28.6%)	3 (21.4%)

}  $P = 0.12$

**Table 4.** Severe complications which developed in the patients with liver cirrhosis who underwent surgery for gastric cancer

Case no.	Age	Sex	Gastric cancer	Child's classification	Operation	Lymph node (LN) dissection		Postoperative course	Hospital outcome
						Degree	(LN in hepatoduodenal ligament)		
1	78	F	Advanced	C	Distal gastrectomy	D <sub>2</sub>	Complete	Heart failure	Died after 4 days
2	57	M	Early	B	Distal gastrectomy	D <sub>2</sub>	Complete	Massive ascites (lymphorrhea) — Liver failure — DIC	Died after 100 days
3	64	M	Advanced	A	Distal gastrectomy	D <sub>2</sub>	Complete	Massive ascites (lymphorrhea) — Laparotomy (unsuccessful) — Ascites continued — Renal failure — DIC	Died after 99 days
4	70	M	Advanced	B	Distal gastrectomy	D <sub>0</sub>	No	Massive ascites — (lymphorrhea) — Renal failure — DIC	Died after 67 days
5	71	M	Advanced	B	Distal gastrectomy	D <sub>2</sub>	Complete	Massive ascites — Laparotomy (successful) Ascites decreased	Alive
6	74	M	Advanced	C	Proximal gastrectomy	D <sub>0</sub>	No	Massive ascites — Heart failure — Ascites gradually decreased	Alive
7	58	M	Early	A	Distal gastrectomy	D <sub>1</sub>	Incomplete	Massive ascites — Ascites gradually decreased	Alive
8	67	M	Early	B	Distal gastrectomy	D <sub>1</sub>	No	Intraabdominal bleeding — Laparotomy, hemostasis	Alive
9	50	F	Early	C	Distal gastrectomy	D <sub>1</sub>	Incomplete	Gastrointestinal bleeding	Alive
10	58	M	Early	A	Distal gastrectomy	D <sub>0</sub>	No	Gastrointestinal bleeding	Alive

DIC, disseminated intravascular coagulation

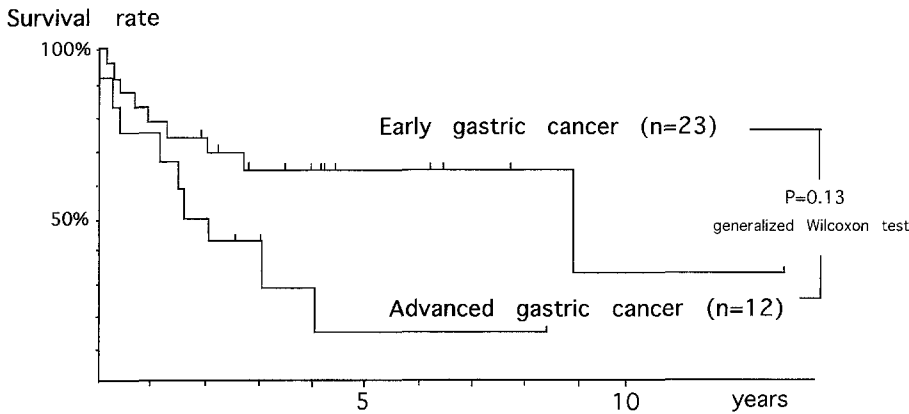
#### Patients Who Developed Severe Postoperative Complications

The clinical features of the ten patients who developed severe complications are outlined in Table 4. Patient 1 had Child's type C liver cirrhosis, underwent D<sub>2</sub> lymph node dissection, and died of heart failure after 4 days. Patients 2–7 developed massive ascites from 600 to 1500 ml/day after the operation, and three died. Patients 2, 3, and 5, who had Child's type A or B liver cirrhosis, underwent D<sub>2</sub> lymph node dissection with complete dissection of the nodes in the hepatoduodenal ligament. Patient 2 developed massive ascites as lymphorrhea, then liver failure followed by disseminated intravascular coagulation (DIC), and died on the 100th postoperative day. Patients 3 and 5 also developed approximately 1000 ml/day of lymphorrhea ascites postoperatively. These two patients underwent laparotomy. In case 5, the point of lymphorrhea behind the hepatoduodenal ligament was ligated, following which the massive lymphorrhea was stopped and the patient survived, but in case 3, the point of lymphorrhea could not be found. Therefore, the lymphorrhea continued,

followed by renal failure, and the patient died of DIC on the 99th postoperative day. Case 4 developed uncontrollable massive ascites postoperatively, even though only limited lymph node dissection (D<sub>0</sub>) and been performed, leading to renal failure and DIC, and the patient died on the 67th postoperative day.

#### Long-Term Outcome

In the patients who underwent curative resection, the cumulative 5-year survival rate was 63.7% for those with early gastric cancer, and 13.9% for those with advanced gastric cancer (Fig. 1). Of the 23 patients with early gastric cancer, 9 died: 2 of liver failure, 2 of hepatoma, 2 of postoperative complications, 1 following the recurrence of gastric cancer, and 2 of other causes. Of the 12 patients with advanced gastric cancer, 9 died: 4 following the recurrence of gastric cancer, 2 of liver failure, 2 of postoperative complications, and 1 of hepatoma. Thus, a total of 7 patients died as a result of liver failure or hepatoma, and 5 patients died as a result of the recurrence of gastric cancer after discharge from hospital.



**Fig. 1.** Cumulative survival curve of the patients with liver cirrhosis who underwent curative resection for gastric cancer (calculated by the Kaplan-Meier method)

## Discussion

Abdominal surgery for patients with liver cirrhosis involves a significant risk of fatal complications developing postoperatively, including excessive bleeding, liver failure, and sepsis.<sup>2-6</sup> Therefore, the therapeutic strategies for gastric cancer patients with liver cirrhosis are controversial due to the high postoperative morbidity and mortality, and because cirrhosis itself is considered to be a terminal stage of liver disease. In a previous report,<sup>7</sup> we demonstrated the factors related to the high incidence of severe postoperative complications (28.5%) in gastric cancer patients with liver cirrhosis, namely, Child's type C disease, a preoperative serum GOT over 80 U/l, bilirubin over 1.1 mg/dl, albumin below 3.0 g/dl, and an ICG R<sub>15</sub> over 35%. In that study we observed that in the presence of intraperitoneal venous dilatation, dissection of the hepatoduodenal ligament lymph nodes increased the risk of severe complications and mortality. Subsequently, we have since performed operations with limited radicality for patients with these risk factors, and although severe postoperative complications have been reduced, they did occur in two patients in the present series, being cases 3 and 8 (18%). Neither of these patients had the above-mentioned preoperative risk factors, but they developed massive lymphorrhea after radical lymph node dissection.

The mortality rate of patients with cirrhosis undergoing abdominal surgery has been reported to range from 0% to 30%,<sup>2-7,10-12</sup> and the predictive risk factors of postoperative difficulty include Child's type C disease,<sup>2,6,7,11</sup> a low serum albumin level,<sup>2,6,7</sup> a high bilirubin level,<sup>2,6,7</sup> a prolonged prothrombin time,<sup>2,3,5,12</sup> a high ICG R<sub>15</sub> after venous injection,<sup>6,7</sup> emergency operations,<sup>2,12</sup> and massive intraoperative bleeding.<sup>2,4,6,12</sup> However, in the present series, no significant differences were recognized in these parameters between the severe complication group and the no complication group. The reason for this may be that since 1989, we have adopted the practice of performing operations with limited

radicality to reduce the incidence of postoperative complications.

There have been few reports<sup>7,10</sup> describing the surgical procedures and postoperative complications of operations performed for gastric cancer accompanied by liver cirrhosis. Takeda et al.<sup>10</sup> reported good results with a mortality rate of 0% and a complication rate of 20%. Although postoperative severe ascites occurred in 5% of the patients in their series (2/40), it developed in 6 of our patients (15.4%), 3 of whom died in hospital. Thus, we consider that postoperative massive ascites, especially lymphorrhea after radical lymph node dissection, is one of the most dangerous complications after surgery for gastric cancer. In cirrhotic patients, a large amount of lymph fluid tends to be produced and to stagnate in the abdominal cavity;<sup>13</sup> therefore, the possibility of massive lymphorrhea developing postoperatively increases when extensive lymph node dissection is performed. The lymph nodes, in the hepatoduodenal ligament especially, might be more prone than other lymph nodes to causing lymphorrhea. In our series, 3 of the 4 patients who died had undergone complete resection of the hepatoduodenal ligament lymph nodes.

Dissection of the hepatoduodenal ligament lymph nodes can be effective for achieving curative resection of gastric cancer located in the distal third of the stomach.<sup>14</sup> However, based on our experience, we recently adopted the strategy that complete lymph node dissection along the hepatoduodenal ligament should be avoided in patients with cirrhosis, except those in whom metastases are macroscopically evident in these lymph nodes.

The aims of the surgical treatment of gastric cancer are to improve long-term outcome and limit the risk of complications. In the present series, the 5-year survival rates of the patients with cirrhosis, being 64% for those with early gastric cancer, and 14% for those with advanced gastric cancer, were worse than the survival rates of patients without cirrhosis, being 86.6% for those with early gastric cancer, and 52.0% for those with

advanced gastric cancer. The most frequent causes of death in the former group were cirrhosis-related, such as hepatic failure or hepatoma, followed by the recurrence of gastric cancer and postoperative complications. Takeda et al.<sup>10</sup> also reported in their series that deaths were due mainly to cirrhosis-related causes. Thus, it is necessary to improve the operative procedures performed for such patients, bearing in mind that aggressive surgery should not be carried out with the sole aim of achieving a curative resection.

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