Surgical Treatment for Upper Gastric Cancers

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Summary: From 1975 to 1984, 1114 patients with gastric cancers were admitted to our surgical department. Among these cancers, upper gastric cancers were present in 190 (17%) patients. 54% of these upper gastric cancers had invaded the esophagus. For cancers of the gastro-esophageal junction, two approaches for surgical resection were employed. A thoraco-abdominal approach was used for cancers at a more advanced stage with more extensive esophageal involvement, while an abdominal approach was used for less advanced cancers. However, the overall survival rate was similar for each procedure; 40% and 39%, respectively. This is probably due to more complete lymphnode dissection that can be accomplished by the thoraco-abdominal approach.

Key words: upper gastric cancer — gastro-esophageal junction — thoraco-abdominal approach — lymphnode dissection — 5 year survival rate

Introduction

The prognosis of gastric cancer has improved year by year due to advancement in diagnosis and treatment. However, upper gastric cancers cause many problems during treatment. 190 patients with adenocarcinomas of the gastric cardia, who were admitted to our institute, were retrospectively evaluated. The purpose of this report is to describe on different resection procedures for upper gastric cancers and to analyze their advantages and disadvantages.

Patients and Methods

From January, 1975 to December, 1984, 1114 patients with gastric cancers were admitted to our surgical department. 753 males and 361 females were involved. The age range was 20 to 89 years, with a mean of 58.4 years for the males, and 56.3 years for the females. Of these, 1041 patients underwent surgical exploration. Gastric cancers in 894 (85.9%) patients were resected, but in 147 (14.1%) patients, the cancer could not be resected. The operative mortality rate was 2.4%, occurring in 25 patients.

Among these cancers, upper gastric cancers were present in 190 patients of which 178 patients underwent surgical exploration. Cancers in 159 (89.3%) patients were resected. Cancers extending to the middle third of the stomach and squamous cell carcinomas were excluded from the present study.

Tumors were divided into 3 groups according to their extent of invasion. Upper gastric cancer with no invasion to the esophagus (Group C) occurred in 73, cancer with some esophageal invasion (Group C>E) in 76, and cancer with much esophageal invasion (Group C=E) in 10 patients (Fig. 1). All resected cancers were pathologically staged according to the
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Fig. 1. Distribution of cases by anatomical region

TABLE 1

Tumor Location and Stage of Carcinoma

<table>
<thead>
<tr>
<th>Location</th>
<th>Stage I</th>
<th>Stage II</th>
<th>Stage III</th>
<th>Stage IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>28 (38.4%)</td>
<td>10 (13.7%)</td>
<td>26 (35.6%)</td>
<td>9 (12.3%)</td>
</tr>
<tr>
<td>C &gt; E</td>
<td>8 (9.3%)</td>
<td>8 (9.3%)</td>
<td>45 (52.3%)</td>
<td>25 (29.1%)</td>
</tr>
</tbody>
</table>

general rules of the Japanese Research Society for Gastric Cancer (Japanese Research Society for Gastric Cancer, 1981). Cancers in stage I are those limited to the muscle layer (pm) with no prevailing evidence of metastasis to lymphnodes or other organs. In stage II, minimal invasion to the serosa or positive proximal lymphnode metastasis is present. Stage III includes definitive serosal infiltration or positive metastasis to perigastric lymphnodes which are located adjacent to the left gastric artery, the celiac axis, the common hepatic artery, the splenic artery, or the splenic hilus. In stage IV, invasion or distant metastasis to another organ, or peritoneal dissemination is noted.

The number of tumors at each stage are summarized in Table 1. 38.4\% were in stage I, and 35.6\% in stage III for Group C. On the other hand, 52.3\% were in stage III and only 9.3\% were in stage I for the cases in group C > E and Group C = E.

Results

Operative procedure

Among the 73 patients in Group C, 71 (97\%) underwent resection through the abdominal approach. Two patients were treated by the thoraco-abdominal approach because invasion to the esophagus was preoperatively suspected, but in reality, no invasion existed histologically.

Among the 86 patients in Group C > E and Group C = E, 23 (27.0\%) were operated through the abdominal approach (including 7 transhiatal esophagectomies without thoracotomy, 5 partial proximal gastrectomies and 2 total gastrectomies). The remaining 63 (73.0\%) patients underwent gastric resection by the thoraco-abdominal approach. The majority of carcinomas with esophageal invasion extending further than 1 cm were treated by the thoraco-abdominal approach (Table 2).

For 25 early cancers (early cancers are defined as cancers limited to the mucosa
and the submucosa), total gastrectomy was performed in 9 and proximal gastrectomy was performed in 16 in which esophagogastrectomy without thoracotomy in 7 were performed. Roux-en-Y reconstruction were mainly used following total gastrectomy, and end-to-side esophagogastronomy following proximal gastrectomy. Extended lymphnode dissection was carried out during the radical operation. Splenectomy and distal pancreatectomy were routinely added for advanced cancers to achieve complete lymphnode dissection. The anastomosis was manually performed mainly in 2 layers.

Feeding jejunostomy or gastrostomy was not created, and nutrition was maintained by intravenous hyperalimentation. The nasogastric tube was left in place until intestinal function was evident by the passage of flatus.

**Operative mortality**

The overall operative mortality rate was 1.9 %, occurring in 3 patients. Leakage of the anastomosis was the main fatal postoperative complication. As for operative mobility, major leakage was seen in 3.2 % of the abdominal and in 4.5 % of the thoraco-abdominal approaches.

**Lymphnode metastasis**

The positive lymphnode metastatic rate was 33 % for tumors smaller than 4 cm in diameter, 58 % for those between 4 and 8 cm and 68 % for those larger than 8 cm. The rate of positive lymphnode metastasis for the thoraco-abdominal approach was higher, and metastasis was present in 18 % of the lower thoracic paraesophageal lymphnodes and in 15 % of diaphragmatic nodes. Therefore, in the thoraco-abdominal approach, dissection of those lymphnodes at the lower mediastinum appeared to be required.

**Survival**

According to staging, the 5 year survival rate was 86 % at stage I, 76 % at stage II, 29 % at stage III and only 6 % at stage IV by the Kaplan-Meier method (1958) (Fig. 2). The 5 year survival rate was 76 % for tumors smaller than 4 cm in diameter, and 31 % for those between 4 and 8 cm (Table 3).

The 5 year survival rate was 75 % for carcinomas without lymphnode metastasis (n0), and it was 61 % for carcinomas with metastasis to the proximal nodes (n1). However for carcinomas with metastasis to the intermediate and distal lymphnodes (n2, n3, n4), the 5 year survival rate was only 10 % (Table 4).

The 5 year survival rates of patients who underwent the radical operation are shown in Table 5 for each operation method. For early carcinomas, no significant difference in the survival rates was noted between total and proximal gastrectomy;

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**TABLE 2**

<table>
<thead>
<tr>
<th>Location</th>
<th>Abdominal Approach</th>
<th>Thoraco-Abdominal Approach</th>
<th>No. of Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>71 (97%)</td>
<td>2 (3%)</td>
<td>73</td>
</tr>
<tr>
<td>C ≥ E</td>
<td>23 (27%)</td>
<td>63 (73%)</td>
<td>86</td>
</tr>
</tbody>
</table>
TABLE 3
5 years survival rate according to size of carcinoma

<table>
<thead>
<tr>
<th>Size</th>
<th>No. of Cases</th>
<th>5. Y. S. R.</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;4 cm</td>
<td>48</td>
<td>76%</td>
</tr>
<tr>
<td>4 ≤ S ≤ 8 cm</td>
<td>74</td>
<td>31%</td>
</tr>
<tr>
<td>&gt;8 cm</td>
<td>26</td>
<td>7%</td>
</tr>
</tbody>
</table>

TABLE 4
5 years survival rate according to positive lymphnode metastasis

<table>
<thead>
<tr>
<th>Nodes</th>
<th>No. of Cases</th>
<th>5. Y. S. R.</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Metastasis (no)</td>
<td>50</td>
<td>75%</td>
</tr>
<tr>
<td>Group 1 (n1)</td>
<td>33</td>
<td>61%</td>
</tr>
<tr>
<td>Group 2 (n2, n3, n4)</td>
<td>65</td>
<td>10%</td>
</tr>
</tbody>
</table>

TABLE 5
5 years survival rate according to the operative method

<table>
<thead>
<tr>
<th>Cancer Extent</th>
<th>Total Gastrectomy</th>
<th>Proximal Gastrectomy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early (n=16)</td>
<td>100%</td>
<td>89.0%</td>
</tr>
<tr>
<td>Advanced (n=70)</td>
<td>60.9%</td>
<td>33.2%</td>
</tr>
</tbody>
</table>

(radical operation cases)

Fig. 2. 5 years survival rate according to stage

Fig. 3. 5 years survival rate according to surgical approach on the cases with esophageal invasion. (radical operation cases)

100% and 89%, respectively. On the other hand, for advanced carcinomas, 60.9% survival for total gastrectomy was significantly greater than 33.3% survival for proximal gastrectomy. 15 patients with carcinomas invading the esophagus were radically operated on only by the abdominal approach with a 5 year survival rate of 39%, while 38 were radically operated only by the thoraco-abdominal approach with a 5 year survival rate of 40% (Fig. 3). No statistical difference was present between the approaches. However, the thoraco-abdominal approach was used in patients with more extensive esophageal involvement or in a more advanced stage.

Discussion

Surgical results for gastric cancers have markedly improved because of early diagnosis and advances in operative techniques and in pre and post-operative management. However at present, upper gastric cancers including cardia cancers usually do not yield satisfactory surgical results in spite of advanced surgical procedures and improved chemotherapy and immunotherapy. This is due to a difficulty
In detecting the cancer early in this area resulting in a high incidence of advanced cancers and complex patterns of lymph-node metastasis.

In the present report, 190 upper gastric cancers experienced during the past 10 years were reviewed with particular attention to the surgical procedures and the prognostic factors. Squamous cell carcinomas, primary esophageal adenocarcinomas localized in the esophagus far away from the esophago-gastric junction and carcinomas invading the middle to lower third of the stomach were all excluded from this study, and only upper gastric carcinomas (C and $C\geq E$) were evaluated. The approaches to the tumor and the operative procedures generally used in this study are as follows.

Cardia cancers (the center of tumor is located within 2 cm from the esophago-gastric junction) are frequently associated with disturbed passage of food. Therefore, even when curability cannot be established by surgical resection, palliative resection is conducted. If even palliative resection is judged to be difficult, esophageal intubation or a bypass operation is performed for palliation.

Gastrostomy or jejunostomy is, in general, not performed because these procedures do not satisfy the patient due to the inability to ingest food.

Cancers confined to the upper third of the stomach (Group C) are approached solely by laparotomy without thoracotomy (abdominal approach). In addition, cancers in Group $C>E$ or $C=E$ have also been approached mainly by laparotomy, when preoperative radiography and endoscopy reveal that the esophageal invasion is less than 1 cm from the esophago-gastric junction. In such an instance, careful preoperative evaluation using endoscopic Lugor staining and biopsy is required for abnormalities at the oral side of tumor because of the presence of intramural metastasis in the esophagus.

When tumor invasion to the esophagus is more than 1 cm by preoperative examinations, the left thoraco-abdominal approach is the treatment of choice. The patient is placed in a right semi-lateral position on a rotatable operation table. The left chest is elevated approximately 25° by inserting a folded sheet under the left scapula. Laparotomy usually precedes thoracotomy in the thoraco-abdominal approach, because intraabdominal conditions should first be explored for tumor assessment. In an upper abdominal laparotomy, a skin incision is made to approximately 5 cm below the xyphoid process, and is later extended to the left antero-lateral thoracic incision. Following abdominal exploration, thoracotomy is performed through the sixth intercostal space. About 1.5 cm of the costal cartilage is excised. In the left thoraco-abdominal approach, when the thoracic esophagus is resected for a long distance, the skin incision is extended upwardly to the axillary area to make an axillo-antero-lateral thoracotomy. Thoracotomy is posteriorly continued to the costovertebral joint to obtain a wide surgical field without rib fracture after a thoracic retractor is applied. Such a thoraco-abdominal approach allows us to simultaneously visualize both the abdominal and thoracic cavities and to perform the intrathoraco-abdominal operative procedures with ease.

The diaphragm is incised to the esophageal hiatus. The anterior branch of the left phrenic nerve is transected, while its lateral and posterior branches are preserved to maintain postoperative diaphragmatic function and, thus, to prevent pulmonary complications. When tumor invasion to the diaphragm is apparent or suspected, partial combined resection of the diaphragm is performed and all phrenic branches are severed. Following extensive resection of the diaphragm, its reconstruction is achieved using a Marlex mesh or a latissimus dorsi muscle flap.
With the left axillo-antero-lateral thoracotomy, operative procedures can be carried out under direct inspection just below the bronchial bifurcation. However, esophageal resection oral to the carina requires blind finger dissection of the upper thoracic esophagus. In rare instances, the cervical esophagus is anastomosed to a reconstructed colonic segment at the neck. The esophagus is transected at more than 5 cm above the tumor to avoid positive microscopic cancer invasion at the esophageal stump (ow (+)). Lower mediastinal lymphnode dissection is completed at the same time, and the stomach is totally resected in advanced cancers.

In our series, positive lymphnode metastasis was microscopically proven for lower paraesophageal nodes in 18% and for diaphragmatic nodes in 15% of thoraco-abdominal operations. Such mediastinal lymphnode metastases were frequently associated with cancers greater than 5 cm, largest diameter, cancers with obvious serosal infiltration, and cancers with esophageal invasion more than 2 cm in length. Therefore, the thoraco-abdominal approach is absolutely indicated for treatment of these cancers.

Other approaches such as transhiatal esophagectomy without thoracotomy are reported for cardia cancers (Gold Faden et al. 1986). Esophageal reconstruction using a remnant gastric tube or the colon after total gastrectomy has been attempted. Transhiatal esophagectomy has been considered advantageous in terms of low perioperative complications and mortality rates as compared to transthoracic esophagectomy. However, the transhiatal approach is not suitable for complete lymphnode dissection in the lower mediastinal area, and therefore cannot be recommended. Furthermore, reconstruction with the remnant gastric tube causes incompleteness in abdominal lymphnode dissection for advanced cancers. For this reason, this method is employed without thoracotomy only for early esophageal cancers or for cardia cancers in high-risk patients for thoracotomy.

As an operative procedure for the upper gastric cancers, the choice of either proximal gastrectomy or total gastrectomy depends on the advancement of the cancer; whether early or advanced cancers. For early gastric cancers of the upper stomach, lymphnode metastases occur in only 15 to 20% of the cases and mainly in the proximal nodes such as bilateral pericardia nodes and lesser curvature nodes, which are readily dissected by proximal gastrectomy. The postoperative prognosis with proximal gastrectomy is comparable to that for total gastrectomy. Therefore, proximal gastrectomy is used for early cancers in the upper stomach. Reconstruction after proximal gastrectomy is accomplished by jejunal interposition using approximately 25 cm of jejunal loop positioned between the esophagus and the remnant stomach. Jejunal interposition using 40 to 45 cm of the jejunum is also utilized following total gastrectomy for early cancers.

When proximal gastrectomy was used in the present series for advanced cancers of the upper stomach, lymphnode dissection tended to be incomplete; and the 5 year survival rate was as low as 33.2%, even in operations in which a curative resection was considered to be accomplished. On the other hand, total gastrectomy for advanced cancers had a 5 year survival rate of 60.9% following curative resection. Total gastrectomy usually includes resection of the omentum and the anterior sheath of the transverse mesocolon, distal pancreatectomy and splenectomy, which permits more extended and complete lymphnode dissection. The clearly better results with total gastrectomy than with proximal gastrectomy is presumably due to the radical lymphnode dissection.

Castrini and Pappalardo (1981) have
shown a high incidence of metastasis to the pyloric, greater curvature, and splenic nodes in adenocarcinomas as compared to squamous cell carcinomas of the cardia. Extended total gastrectomy resulted in a significantly higher survival rate than proximal subtotal gastrectomy. There were no significant differences in operative mortality between the two approaches. Other authors have reported a significantly higher mortality in patients after radical lymphnode dissection and have advised against its routine use. Our results revealed that the operative mortality with the extended total gastrectomy was not higher than with the proximal subtotal gastrectomy, and thus supported the results of Papachristou et al. (1980). Although the operative mortality of total gastrectomy has been reported to be 10 to 20% (Hassler et al. 1986), in our series it was only 1.9% with no differences in operative procedures and approaches. Therefore, extended total gastrectomy is considered to be a relatively safe operation and, in addition, enables us to perform curative resection for advanced cancers of the upper third of the stomach. Together with extended gastrectomy, complete lymphnode dissection is desired to obtain a higher cure rate for the stomach cancer, and thereby to achieve a better prognosis.

Conclusion

17% of gastric cancers occurred in the upper third of the stomach, and 54% of these upper gastric cancers had invaded the esophagus. For cancers of the gastro-esophageal junction, two approaches for surgical resection were employed. A thoraco-abdominal approach was used for cancers at a more advanced stage with more extensive esophageal involvement, while an abdominal approach was used for less advanced cancers. However, the overall survival rate was similar for both procedures. This is probably due to a more complete lymphnode dissection that can be accomplished by the thoraco-abdominal approach. It can be concluded from this study that the thoraco-abdominal approach should be used for carcinoma of the gastro-esophageal junction with extends more than 1 cm into the esophagus.

The present study also indicates that early cancers in the upper third of the stomach can be treated by proximal gastrectomy whereas advanced cancers should be treated with by total gastrectomy.

References