Surgical Treatment of Early Gastric Cancer

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Introduction

The definition of early gastric cancer is tumor confined to the mucosal layer or the mucosal and submucosal layer, regardless of lymph node status [1]. In Japan around half the gastric cancers are found in early stages [2]. According to this, many treatment options for early gastric cancer have been developed to maintain the patients' quality of life even after treatment. One of the remarkable changes in treatment is the use of endoscopic submucosal dissection. The condition for this treatment is that the tumor can be dissected under endoscopy and that there are no lymph node metastases. To fulfill this condition, accumulated data on resected gastric cancer status without lymph node metastasis were analyzed. The surgery has also been modified for early gastric cancer. One of the modifications is the extent of lymph node dissection. Laparoscopy-assisted gastrectomy is also a new technique in the treatment of early gastric cancer.

To apply these treatments correctly, the 1st edition of the Guidelines for Gastric Cancer Treatment was published in 2001 [3] and the 2nd edition was published in 2004 [4]. The guidelines are very useful for the application of standard treatment in clinical settings. They divide the treatment methods into a daily clinical category and a clinical research category, which means that there is potential to improve treatment for gastric cancer. In this article, we will discuss the surgical treatment of early gastric cancer as well as the prognosis of the patients.
Epidemiology

In 2002, the mortality rate from gastric cancer was around 40 in 100,000 in Japan. In 1998, the age-adjusted disease rate was 60.4 in 100,000 and the age-adjusted mortality rate was 27.3 in 100,000. Both the age-adjusted disease rate and the age-adjusted mortality rate have gradually decreased. However, without adjustment both rates have not changed due to the increase in higher age groups in the population.

Data on gastric cancers treated in 1991, registered by the Japanese Gastric Cancer Association, were recently published [2]. At that time, endoscopic mucosal dissection was not as common, and most of the tumors were surgically resected with lymph node dissection. The data on 8,851 patients with primary gastric cancer were collected from 113 hospitals, and the data on 7,935 patients could be analyzed. Among the 7,935 cases, 3,871 (48.8%) tumors were in the early stages, including 2,209 (27.8% of tumors, 57.1% of early tumors) mucosal tumors and 1,662 (20.9%, 42.9%) submucosal tumors. 5,493 (69.2%) patients were male and 2,441 (30.8%) female. The age distribution is shown in Table 1. The incidence of gastric cancer increases after 40 years of age and is highest in the 60- to 79-year age group. The prognosis of gastric cancer itself does not differ between age groups.

Diagnosis

Health check-up program is in progress for people over 39 years of age in Japan. In an ordinal health check-up, barium-swallow roentgenoscopy or serum pepsinogen are common. However, more and more people are having endoscopy without barium swallow. The reason for this may be that patients with suspected lesions on barium swallow have to have endoscopy, and they want to finish the examination with one method. Another reason may be that many physicians believe endoscopy is more sensitive than barium swallow.

Endoscopic Treatment

The diagnosis of gastric cancer is made histologically from tissue biopsied under endoscopy. The depth of invasion is diagnosed using endoscopy and endoscopic ultrasonography. Lymph node metastasis is analyzed with computed tomography, ultrasonography, and endoscopic ultrasonography. Distant metastases are also analyzed with computed tomography.

Surgical Treatment

Guidelines

The guidelines for early gastric cancer in daily clinical settings and in clinical research are shown in tables 2 and 3 [3, 4]. In fact, N2 or N3 early gastric cancer is rarely diagnosed. A mucosal tumor without lymph node metastases and a submucosal tumor of differentiated histological type, <1.5 cm in diameter, can be operated using minimal lymph node dissection D1+. A tumor of >2.1 cm in diameter with N1 lymph node metastases and a tumor with N2 lymph node metastases.
metastases require standard operation. Other early gastric cancers with N0 or N1 can be operated using minimal lymph node dissection D1+β.

Reconstruction
The form of reconstruction after the resection of the stomach is one of the important issues in the treatment of early gastric cancer because of the good prognosis of the patients. Traditionally, Billroth I and Billroth II are common methods of reconstructions after distal gastrectomy. Many surgeons do not prefer Billroth II because of its bile reflux, remnant gastritis, and the high rate of gastric stump cancer. In place of Billroth II, Roux-en-Y reconstruction is now becoming common for reconstruction after distal gastrectomy. Compared to Billroth I, Roux-en-Y has a low rate of remnant gastritis, gastric stump cancer, and anastomotic leakage; however, Roux-en-Y has a higher rate of Roux stasis syndrome, gallbladder stone formation, and needs a longer operation time. No comparison of the clinical data in a large volume randomized control study has been made, but the superiority of Roux-en-Y with regard to less bile reflux and less inflammation in the remnant stomach and its inferiority with regard to the long operation time and long hospital stay have been reported [5].

After total gastrectomy, Roux-en-Y reconstruction and jejunal interposition are the common methods. Jejunal interposition makes foods pass through duodenum but the operation technique is more complicated. A preliminary randomized clinical trial was started about 5 years ago, but no difference was detected among the roughly 200 patients between these two methods.
Pouch reconstruction is one of the options for reconstruction after distal gastrectomy, proximal gastrectomy, and total gastrectomy. There are very little data to support pouch reconstruction, and the efficacy of pouch reconstruction has not yet been defined. In our opinion, an evaluation of the quality of life depending on the time course after operation will be needed for the pouch reconstruction [6, 7].

Pylorus-preserving gastrectomy (PPG) following gastro-gastro anastomosis can be included in the reconstruction options. PPG is a modification of distal gastrectomy preserving 2–3 cm of the pyloric cuff which maintains pylorus ring function. The indication of PPG is restricted to tumors with a distance of more than 4.5–5 cm from the pylorus ring to maintain the distal margin (fig. 1) [8, 9]. The incidence of early dumping syndrome is reported to be lower in PPG (8%) than in distal gastrectomy with Billroth I reconstruction (33%) [10].

**Fig. 1.** Schematic illustration of pylorus-preserving gastrectomy (PPG). Anastomosis of PPG. The proximal portion of the stomach is resected with a 75-mm linear cutter. The resection is the same as in conventional distal gastrectomy (a). A two-layer primary gastro-gastro anastomosis is performed; that is, the mucosal layer is sutured continuously with 3-0 absorbable monofilament (b). The seromuscular layer is sutured by a knotting suture with 3-0 Vicryl (c). The stomach is placed back into the abdominal cavity (d), and the closed drain is advanced through the Winslow foramen to the left infrahepatic cavity.

**Laparoscopy-Assisted Surgery**

Laparoscopy-assisted gastrectomy with lymph node dissection is now one of the modalities for early gastric cancer surgery [11]. The guidelines also define laparoscopy-assisted surgery as a treatment of clinical stage IB cancer. The quality of laparoscopic surgery is reported not to be worse than conventional open laparotomy surgery, and the surgical invasiveness is reported to be less in laparoscopy-assisted surgery [12, 13]. A new issue in the laparoscopic surgery is the education of younger surgeons.

**Sentinel Node Navigation Surgery**

Sentinel node navigation surgery is still under trial for gastric cancer. It is still difficult to detect sentinel nodes and dissect lymph nodes in order to analyze the accuracy of the method. Several reports agree that the indication of sentinel node mapping is early cN0 tumors [14, 15].
The detection rate is reported to be 95%, the false-negative rate of lymph node metastasis is 4%, which is still too high to apply sentinel node navigation surgery without lymph node dissection other than the detected sentinel node. Further improvements are needed.

**Prognosis**

The Kaplan-Mayer curve is shown in figure 2. The 5-year survival of early gastric cancer is 90.4%. Recurrent pattern is shown in table 4. The 5-year survival of stage IA gastric cancer is 93.4%, and that of stage IB is 87.0%. Comparing these data, adjuvant chemotherapy or/and neoadjuvant chemotherapy will be needed even for early gastric cancer when lymph node metastasis is suspected.

![Fig. 2. Overall survival and depth of invasion. pT1 is early cancer. The 5-year survival following early gastric cancer is >90%. dd = Data defect; lof = loss of follow-up.](image)

### Table 4. Prognosis and recurrent pattern of resected early gastric cancer

<table>
<thead>
<tr>
<th></th>
<th>Total number</th>
<th>Survival, %, at 1 year</th>
<th>Survival, %, at 2 years</th>
<th>Survival, %, at 3 years</th>
<th>Survival, %, at 4 years</th>
<th>Survival, %, at 5 years</th>
<th>Recurrence local</th>
<th>Recurrence peritoneal</th>
<th>Recurrence liver</th>
<th>Recurrence distant metastases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mucosa</td>
<td>2,209</td>
<td>98.0</td>
<td>96.6</td>
<td>95.2</td>
<td>94.0</td>
<td>92.5</td>
<td>6 (0.3%)</td>
<td>4 (0.2%)</td>
<td>3 (0.1%)</td>
<td>2 (0.1%)</td>
</tr>
<tr>
<td>Submucosa</td>
<td>1,662</td>
<td>96.0</td>
<td>93.7</td>
<td>90.8</td>
<td>89.3</td>
<td>87.6</td>
<td>17 (1.0%)</td>
<td>14 (0.8%)</td>
<td>17 (1.0%)</td>
<td>7 (0.4%)</td>
</tr>
</tbody>
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References