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Comparative analysis of the outcomes of gastrectomy *vs.* endoscopic mucosal resection or endoscopic submucosal dissection for the treatment of gastric tube cancer after esophagectomy

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Abstract: This study investigated the clinical characteristics of patients with gastric tube cancer following esophagectomy at our hospital, and to examine the outcomes of gastrectomy versus endoscopic submucosal dissection. Of 49 patients who underwent treatment for gastric tube cancer that developed 1 year or more after esophagectomy, 30 patients underwent subsequent gastrectomy (Group A), and 19 patients underwent endoscopic mucosal resection (EMR) or endoscopic submucosal dissection (ESD) (Group B). The characteristics and outcomes of these two groups were compared. The interval between esophagectomy and diagnosis of gastric tube cancer ranged from 1 to 30 years. The most common location was the lesser curvature of the lower gastric tube. When the cancer was detected early, EMR or ESD was performed, and the cancer did not recur. In advanced tumors, gastrectomy was performed but the gastric tube was difficult to approach and lymph node dissection was difficult; two patients died as a result of the gastrectomy. In Group A, recurrence occurred most often as axillary lymph node, bone, or liver metastases; in Group B, no recurrence or metastases were observed. In addition to recurrence and metastasis, gastric tube cancer is often observed after esophagectomy. The present findings highlight the importance of early detection of gastric tube cancer after esophagectomy and that the EMR and ESD procedures are safe and have significantly fewer complications compared with gastrectomy. Follow-up examinations should be scheduled with consideration given to the most frequent sites of gastric tube cancer occurrence and the time elapsed since esophagectomy.

***Keywords*:** gastrectomy, endoscopic submucosal resection, long-term follow-up after esophagectomy, metachronous cancer

Introduction

Esophageal cancers are squamous cell carcinomas or adenocarcinomas that occur in the esophagus. In the past, the prognosis of patients with esophageal cancer was very poor (*1*), but the introduction of a multidisciplinary treatment approach and advanced surgical techniques such as thoracoscopic surgery and robot-assisted esophagectomy have greatly improved therapeutic outcomes. However, there has been a marked increase in the rates of diagnosis of metachronous cancer after the initial esophagectomy (current incidence reported in the literature 11.3%–12%) (*2-5*).

In our hospital in Japan, we have found that metachronous cancer is diagnosed prior to esophagectomy in 6.4% of cases, at the same time as esophagectomy in 4.8% of cases, and after esophagectomy in 12.8% of cases (data not shown). These metachronous cancers are diagnosed most frequently in the oropharynx, hypopharynx, and larynx, which are regions covered by squamous epithelium (*5*), followed by the gastric tube, which is the reconstructed esophagus following esophagectomy (*3-5*). The surgical approach for the resection of gastric tube cancer depends on the reconstruction route used for the prior esophagectomy. If the route used for the reconstruction was the intrathoracic route, the surgery is more invasive than the antethoracic route. Because its route was not necessary to perform thoracotomy. Although the incidence of esophageal cancer is increasing worldwide (*6*), much remains unknown about gastric tube cancer following esophagectomy, such as the common sites of occurrence, patterns of metastasis, most effective treatment methods and follow-up schedules.

Here, we investigated the clinical characteristics of patients with gastric tube cancer following esophagectomy at our hospital and examined the outcomes of gastrectomy versus endoscopic mucosal resection (EMR) or endoscopic submucosal dissection (ESD).

Patients and Methods

Study design

This was a retrospective study conducted at the Department of Surgery, Institute of Gastroenterological Surgery, Tokyo Women's Medical University, Japan. From 1964 to 2012, a total of 2,908 patients underwent radical esophagectomy and esophageal reconstruction at our institute. Of these 2,908 patients, 49 developed gastric tube cancer 1 year or more after esophagectomy and underwent treatment for gastric tube cancer between 1970 and 2020. In the present study, these 49 patients were divided into two groups based on the treatment they received for the gastric tube cancer: 30 patients underwent gastrectomy and were assigned to Group A, and 19 patients underwent endoscopic treatment (EMR or ESD) and were assigned to Group B. The indications for endoscopic mucosal resection EMR or ESD were the same as for gastric cancer, well-differentiated adenocarcinoma (G1); depth of invasion limited to the lamina propria; less than 2.0 cm in diameter; and no ulceration. However, ESD is expanding indications excluding size. Surgery for the treatment of gastric tube cancer was excluded when there was invasion of other organs (T4) or recurrence in other organs (M1).

The study was conducted according to the guidelines of the Declaration of Helsinki and approved by the Ethics Committee of Tokyo Women's Medical University, Approval No. 4582). Informed consent and consent for publication were obtained from all subjects involved in the study.

Statistical analyses

All data are presented as the medians and total ranges unless otherwise stated. Survival was calculated using the Kaplan–Meier method and then compared between groups with the log-rank test. The hazard ratio of survival was calculated with Cox proportional hazard analyses. A p value < 0.05 was statistically significant.

Results

Patient characteristics

Table 1 shows the clinical characteristics of the patients at the time of esophagectomy. 37% in Group A or 37% in Group B were diagnosed Stage I. Lymph node metastasis occurred in 47% in Group A or 58% in Group B. The most common reconstruction route was the antesternal route in Group A, and the posterior mediastinal route in Group B. Neither group received much adjuvant therapy. There were no differences between Group A and Group B except for reconstruction route.

Table 2 shows the clinical characteristics of the patients at the time of diagnosis of gastric tube cancer. Table 3 shows the gastric tube cancer symptoms reported by the patients and the means of detection of the cancer. In Group A, the gastric tube cancer was not diagnosed until it was in an advanced state in 67% and was detected by palpation in 33% of patients; these findings were attributed to the use of the antesternal route of gastric tube reconstruction and to the fact that in the past the intervals between follow-up examinations were longer. In Group B, there were no symptoms because all cancers were discovered in an early stage *via* endoscopy. Because most cancers in Group A were advanced, symptoms at detection included passage obstruction, palpation, and pain. In Group B, all patients were asymptomatic. 55% in the gastric tube cancer was located in the lower gastric tube and 35% was located at the site sutured to form the gastric tube (the resected side of the lesser curvature side). The most common macroscopic classifications of early-stage cancers in Group A and Group B were 0-IIc and 0-IIa, respectively. In Group A, lymph node metastasis, lymphatic vessel invasion, or vascular invasion were observed at similar rates; in Group B no such metastasis or invasion was observed. Histologically, 33% of cases in Group A were poorly differentiated, whereas there was no poorly differentiated cases in Group B. Multiple gastric tube cancers developed in four patients in Group A and in one patient in Group B.

Table 1. Characteristics of the patients at the time of esophagectomy

Parameter	Gastrectomy (n = 30) Group A	EMR or ESD (n = 19) Group B
Mean age at the time of esophagectomy	60.5	64.5
Gender (M/F)	(29 / 1)	(19 / 0)
Location of esophageal cancer (Ut / Mt / Lt / unknown)	(3 / 20 / 5 / 2)	(3 / 10 / 6 / 0)
Depth (T1a / T1b / T2 / T3 / T4 / unknown)	(2 / 9 / 5 / 10 / 0 / 4)	(1 / 6 / 1 / 10 / 1 / 0)
Lymph node metastasis (N0 / N1 / unknown)	(12 / 14 / 4)	(8 / 11 / 0)
Stage (I / II / III / IVa / unknown)	(11 / 5 / 11 / 0 / 3)	(7 / 2 / 9 / 1 / 0)
Reconstruction route (antesternal / retrosternal / posterior mediastinal)	(21 / 5 / 4)	(3 / 2 / 14)
Adjuvant therapy for esophageal cancer (+ / - / unknown)	(6 / 20 / 4)	(3 / 15 / 1)

This criteria is in accordance with the Japanese Classification of Esophageal Cancer 11th 2015 by the Japan Esophageal Society. EMR: endoscopic mucosal resection, ESD: endoscopic submucosal dissection, Ut: upper thoracic esophagus, Mt: middle thoracic esophagus, Lt: lower thoracic esophagus. T1a: Tumor confined to the mucosa (M). T1b: Invasion to but not beyond the submucosa (SM). T2: Invasion to but not beyond the muscularis propria (MP). T3: Invasion to the esophageal adventitia (Ad). T4: Invasion to the adjacent organs (Adj).

Table 2. Characteristics of the patients at the time of diagnosis of gastric tube cancer

Parameter	Gastrectomy (n = 30) Group A	EMR or ESD (n = 19) Group B
Mean age at the time of diagnosis	70.3	67.1
Gender (M/F)	(29 / 1)	(19 / 0)
Location on gastric tube (Upper / middle / lower / unknown)	(4 / 7 / 16 / 3)	(0 / 5 / 11 / 3)
Location of gastric tube (GC / LC / AW / PW / all / unknown)	(2 / 11 / 7 / 3 / 1 / 3)	(2 / 6 / 3 / 5 / 0 / 3)
Macroscopic Classification (0-I / 0-IIa / 0-IIb / 0-IIc / 1 / 2 / 3 / 4 / unknown)	(1 / 4 / 1 / 7 / 3 / 1 / 4 / 5 / 4)	(3 / 10 / 1 / 2 / 0 / 0 / 0 / 0 / 3)
Depth (m / sm / mp / ss / se / si / unknown)	(4 / 6 / 4 / 4 / 10 / 0 / 2)	(16 / 1 / 0 / 0 / 0 / 0 / 2)
Lymph node metastasis (n0 / n1 / no lymphadenectomy / unknown)	(9 / 7 / 9 / 5)	(0 / 0 / 14 / 5)
Lymphatic vessel invasion (0 / 1 / 2 / 3 / unknown)	(9 / 8 / 7 / 1 / 5)	(16 / 0 / 0 / 0 / 3)
Vascular invasion (0 / 1 / 2 / 3 / unknown)	(13 / 6 / 5 / 1 / 5)	(16 / 0 / 0 / 0 / 3)
Stage (I / IIA / IIB / III / unknown)	(13 / 1 / 5 / 8 / 3)	(16 / 0 / 0 / 0 / 3)
Histology (well / mod / poorly / unknown)	(10 / 6 / 10 / 4)	(15 / 1 / 0 / 3)
Double cancer (+ / − / unknown)	(4 / 23 / 3)	(1 / 15 / 3)

This criteria is in accordance with the Japanese classification of gastric carcinoma: 3rd English edition (2011) by the Japanese Gastric Cancer Association (JGCA). GC: greater curvature, LC: lesser curvature, AW: anterior wall, PW: posterior wall, EMR: endoscopic mucosal resection, ESD: endoscopic submucosal dissection. T1a: Tumor confined to the mucosa (M). T1b: Tumor confined to the submucosa (SM). T2: Tumor invades the muscularis propria (MP). T3: Tumor invades the subserosa (SS). T4: Tumor invasion is contiguous to or exposed beyond the serosa (SE) or tumor invades adjacent structures (SI).

Table 3. Gastric tube cancer symptoms and methods of detection

Items	Gastrectomy (n = 30) Group A	EMR or ESD (n = 19) Group B
Symptom		
Passage disturbance	4	0
Palpation	4	0
Pain	4	0
Anemia	1	0
Occult blood	1	0
Weight loss	1	0
None	13	16
Unknown	3	3
Examination		
Endoscopy	17	16
Palpation	10	0
Barium meal	1	0
Unknown	2	3

EMR: endoscopic mucosal resection, ESD: endoscopic submucosal dissection.

Time from esophagectomy to diagnosis of gastric tube cancer

The timing of diagnosis of gastric tube cancer varied from 1 to 30 years after esophagectomy (Figure 1). In Group A, gastric tube cancer was generally not detected for a long time after esophagectomy, whereas in Group B most cases were detected soon after esophagectomy. In our hospital, recurrence of esophageal cancer or gastric reflux soon after esophagectomy is an indication for an upper endoscopy at least once per year, which likely allowed for the detection of early-stage cancers in which EMR or ESD can be used. However, in the past, regular endoscopy was not performed from 6 years after esophagectomy, meaning the gastric tube cancer was often not detected until it was more advanced.

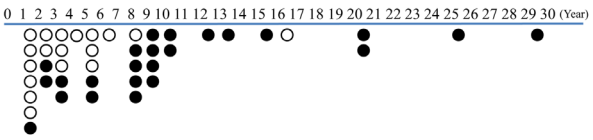

Figure 1. Time from esophagectomy to diagnosis of gastric tube cancer. ● Group A (gastrectomy), 6 patients were unknown; ○ Group B (endoscopic mucosal resection or endoscopic submucosal dissection) 1 patient was unknown.

Operative procedures undergone by patients in Group A

Table 4 shows the operative procedures undergone by the patients in Group A for gastrectomy and esophageal reconstruction. The antesternal route was used in 21 patients who underwent surgery from 1965 to 1992. The retrosternal route was used in 5 patients from 1985 to 2000. The posterior mediastinal route was used in 4 patients from 1986 to 2008. The antesternal route allows for a minimally invasive approach because we do not perform thoracotomy. A total of 12 patients underwent total gastrectomy and reconstruction with pedicled jejunum; however, one patient developed impaired blood flow in the jejunum and underwent additional venous reconstruction involving vascular anastomosis with the external jugular vein. In the remaining nine patients, the tumor mass was in the lower gastric tube; therefore, these patients underwent partial lower gastrectomy with preservation of the right gastroepiploic vessels. Of the five patients who underwent gastrectomy and reconstruction through the retrosternal route, two underwent total gastrectomy and reconstruction with pedicled jejunum, and two, due to their cancer being located primarily in the upper gastric tube, underwent upper gastric tube resection, vascular anastomosis of the internal thoracic artery and external jugular vein, and reconstruction with free jejunum. The remaining patient

Table 4. Operative procedures undergone by patients in Group A (gastrectomy)

Operative procedures	*n*
Antesternal route (*n* = 21)	
Total gastrectomy + reconstruction with pedicled jejunum	*n* = 11
Total gastrectomy + reconstruction with pedicled jejunum + revascularization with internal thoracic artery and external transvenous vein	*n* = 1
Partial lower gastrectomy + reconstruction with Roux-en-Y through laparotomy	*n* = 9
Retrosternal route (*n* = 5)	
Total gastrectomy through median sternotomy + reconstruction with pedicled jejunum	*n* = 2
Partial upper gastrectomy through median sternotomy + reconstruction with free jejunum	*n* = 2
Partial lower gastrectomy + reconstruction with Roux-en-Y through laparotomy	*n* = 1
Posterior mediastinal route (*n* = 4)	
Partial lower gastrectomy + reconstruction with Roux-en-Y through laparotomy	*n* = 2
Partial lower distal gastrectomy + reconstruction with Roux-en-Y through left thoracotomy	*n* = 2

underwent partial lower gastrectomy with preservation of the right gastroepiploic vessels.

Of the four patients who underwent gastrectomy and reconstruction through the posterior mediastinal route, one presented with a tumor in the middle gastric tube, and the remaining three presented with tumors in the lower gastric tube. For the cases of a large tumor in the middle and lower gastric tube, partial lower distal gastrectomy was performed through a left thoracotomy due to the resection reaching the superior margin of the tumor, with the right gastroepiploic vessels preserved. For the two patients for whom resection to the superior margin of the tumor in the lower gastric tube was possible through a laparotomy, partial lower gastrectomy through a laparotomy was performed with the right gastroepiploic vessels preserved.

Outcomes after surgery for gastric tube cancer

Two patients in Group A died within 30 days as a result of the gastrectomy (Table 5). Both patients underwent total gastrectomy and gastric tube reconstruction with a pedicled jejunum through the antesternal route. Recurrence of esophageal cancer was responsible for one death in Group A versus three deaths in Group B; for the three patients in Group B, although the gastric tube cancer was discovered shortly after esophagectomy and the patients went into remission following ESD, esophageal cancer later recurred and resulted in death. Ten patients who underwent gastrectomy for advanced gastric tube cancer died as a result of the gastric tube cancer, whereas none of the patients who underwent ESD and EMR did so. Both groups included two patients that died from other cancers, although their immediate cause of death was attributed to pneumonia.

Metachronous cancers after gastrectomy

Table 5. Outcomes after surgery for gastric tube cancer

Outcomes	Gastrectomy (*n* = 30) Group A	EMR or ESD (*n* = 19) Group B
Gastrectomy-related death (within 30 days)	2	0
Esophageal cancer–related death	1	3
Gastric tube cancer–related death	10	0
Death from other cancer	2	2
Death from other illness	2	1

EMR: endoscopic mucosal resection, ESD: endoscopic submucosal dissection.

Table 6. Occurrence of metachronous cancers

Outcomes	Gastrectomy (*n* = 30) Group A	EMR or ESD (*n* = 19) Group B
Metachronous gastric tube cancer	0	4
Hypopharyngeal cancer	1	1
Gallbladder cancer	1	0
Cholangiocarcinoma	1	1
Colon cancer	1	1
Rectal cancer	1	0
Bladder cancer	1	1

EMR: endoscopic mucosal resection, ESD: endoscopic submucosal dissection.

In Group B, four patients developed metachronous gastric tube cancers and in all four patients the cancer was treatable with EMR or ESD (Table 6). In addition, metachronous hypopharyngeal cancer, cholangiocarcinoma, colon cancer, and bladder cancer were observed in one patient each in both groups with two patients in each group dying of these cancers. The cause of death was a gallbladder cancer or a hypopharyngeal cancer in group A, a cholangiocarcinoma or a hypopharyngeal cancer in Group B.

Sites of metastasis after gastrectomy

Due to early detection of gastric tube cancer, no patients in Group B developed metastasis. In Group A, ten patients who underwent surgery for advanced gastric tube cancer developed metastasis (Table 7). Six patients developed dissemination after gastrectomy. Three patients who underwent total gastrectomy and reconstruction with a jejunal flap through the antesternal route developed axillary lymph node metastasis. Two of these patients subsequently died due to bone metastasis. One patient who underwent partial upper gastrostomy and free jejunal flap reconstruction through median sternotomy developed liver metastasis. He died 20 months later due to metastatic liver cancer.

Survival after gastrectomy

Five-year survival after gastrectomy was 38% in Group A and 60% in Group B (Figure 2). Median survival was

Table 7. Sites of metastasis after gastrectomy in the patients from Group A (gastrectomy) treated for advanced gastric tube cancer

Sites of metastasis	*n*
Right axillary lymph node metastasis	1
Left axillary lymph node metastasis	1
Bilateral axillary lymph node metastasis	1
Bone metastasis	2
Liver metastasis	1
Dissemination	6

938 days in Group A and 1,955 days in Group B. No significant difference between groups was observed (p = 0.1657); in Group B, although no patients died due to gastric tube cancer, some patients died from recurrence of esophageal cancer.

Follow-up for recurrence and metachronous cancers after esophagectomy at our hospital

Figure 3 shows the schedule of follow-up examinations after esophagectomy at our hospital. Testing to detect recurrence of esophageal cancer is performed until year 5. However, metachronous cancers can occur more than 5 years later. Therefore, although the number of CT and GS examinations will decrease, we must test to detect metachronous cancers for more than 10 years. Endoscopy by skilled doctors is performed taking into consideration oropharyngeal and hypopharyngeal cancer, which are difficult to detect metachronous cancers.

Discussion

Curative surgery for thoracic esophageal cancer is the most invasive of digestive tract surgeries, with the morbidity associated with esophagectomy in the range of 36.0% to 58.4% (*7,8*). Due to extremely poor outcomes in the past, cases of metachronous cancers after treatment for esophageal cancer were uncommon. However, the outcomes of esophagectomy for the treatment of esophageal cancer have been greatly improved through the introduction of extended lymphadenectomy and better perioperative management (*9,10*), and extended survival times means that the incidence of metachronous cancers after treatment for esophageal cancer is increasing.

The difficulty of treating advanced gastric tube cancer after esophagectomy depends on the route of reconstruction. Until 1990, the antesternal route was the standard route of gastric tube reconstruction. If the gastric tube is subcutaneous, this approach is relatively simple. However, with the retrosternal route and the posterior mediastinal route, the gastric tube must be approached through a median sternotomy and thoracotomy, respectively. This approach offers the advantages of good handling and visibility because of direct visualization of the gastric tube, but there is a

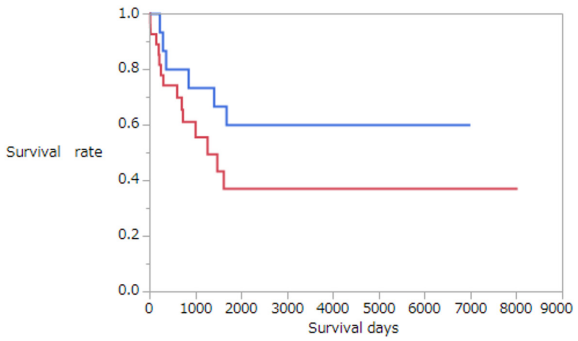

Figure 2. Survival rate after gastrectomy. p = 0.1657. Red: Group A (gastrectomy; n = 30) Blue: Group B (EMR or ESD; n = 19). EMR: endoscopic mucosal resection, ESD: endoscopic submucosal dissection.

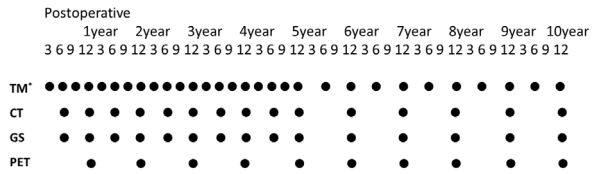

Figure 3. Follow-up examination schedule (years and months post-surgery) at our hospital. TM: tumor marker (CEA, SCC, CYFRA, P53), CT: computed tomography, GS: gastroscopy, PET: positron emission tomography.

higher risk of postoperative bleeding and osteomyelitis (*11*). In addition, postoperative pain often negatively effects respiration (*12*). With these reconstruction routes, total gastrectomy is extremely difficult, and complications occur frequently (*13,14*). For this reason, palliative resection, such as partial resection, is often performed (*15*).

In addition to gastric tube cancer resection, systematic lymphadenectomy must also be performed, as is common for typical gastric cancers. However, when a partial distal gastrectomy is performed, systematic dissection of lymph nodes at the greater curvature side of the gastric tube, which is fed by the right gastroepiploic vessels, is impossible. In such cases, station 6 lymph node dissection (*i.e.*, D1 dissection) is avoided. Consequently, in some cases, surgical treatment is abandoned in favor of chemotherapy and radiotherapy (*16,17*). Perfusion of the right gastroepiploic artery is commonly considered essential for blood supply to the gastric tube. Depending on the operative findings, it may be necessary to sacrifice this artery within the distal partial resection area of the gastric tube. In such cases, reconstruction of the artery *via* a vascular anastomosis should be considered. The extent of lymphadenectomy in cases of gastric tube cancer has not been standardized because long-term results of surgically treated gastric tube cancers are lacking. In our report, when the gastric tube was reconstructed through the antesternal route, we could perform total gastrectomy with lymph node dissection in 57% of cases and we could perform partial lower gastrectomy in 43% of cases.

We could perform an operation, which was minimally invasive surgery, without thoracotomy and reconstruction of the right gastroepiploic artery. In the five cases in which the retrosternal route was used, two cases involved total gastrectomy and reconstruction with a pedicled jejunum, two cases involved partial upper gastrectomy and reconstruction with a free jejunum, and one case involved partial lower gastrectomy and a Roux-en-Y anastomosis through laparotomy. We performed median sternotomy with risk of osteomyelitis in four patients to reach the gastric tube. Gastric tube cancers resectable through the posterior mediastinal route accounted for only four of the present cases, in which the lower gastric tube could be resected through a left thoracotomy or laparotomy. If the location of gastric tube cancer was high, we must perform invasive gastrectomy through a right thoracotomy. It will be a very invasive operation due to the adhesions of the previous operation.

Although the overall postoperative course of the present cases was good, and only two of the patients died as a result of the operation, there have been reports that the postoperative morbidity and mortality rates associated with gastrectomy are high (*18*). Both of the patients who died had undergone total gastrectomy and reconstruction with a pedicled jejunum for gastric tube cancer through the antesternal route and developed sepsis as a result of jejunal necrosis. If there was necrosis of pedicled jejunum, we should perform two step surgery. At first, we perform necrosectomy and external fistula construction. In the second stage surgery we perform reconstruction with a free jejunum. According to some reports (*19*), free jejunal transfer has a high success rate, but if vascular thrombosis occurs, the salvage of a failing flap with reanastomosis is difficult. The technique of vascular anastomosis has improved significantly in the last few years with the progress of breast cancer and transplantation (*20,21*). We could not find any literature regarding patterns of recurrence after gastrectomy. However, in the present study we observed three cases of axillary lymph node metastasis, a pattern of metastasis resembling breast cancer, after gastrectomy through the antesternal route.

In comparison to gastrectomy, EMR and ESD were found to be relatively safe procedures and did not result in any operation-related deaths. However, for these approaches, accurate diagnosis of cancer at an early stage is necessary and, depending on the site of gastric tube cancer, an experienced endoscopist is needed (*22-24*).

Survival outcomes after gastric tube treatment did not differ significantly between the gastrectomy group and the EMR or ESD group. The reason that the patients in Group B were caused by esophageal cancer-related death or death from other illness was because there were less terms from esophagectomy. In other words, it was because esophagectomy for esophageal cancer did not result in a complete cure. However, the present findings do show a marked difference in gastric tube cancer–related death between the two groups (Table 5). It was clear that ESD was beneficial to patients compared with gastrectomy with respect to the complexity of the procedure or gastrectomy-related death (Table 5). We must detect gastric tube cancer early in order to perform ESD or EMR without gastrectomy. Gastric tube cancer was detected within 5years after esophagectomy in 67% patients in the EMR or ESD group, suggesting that the patients who later die do so of recurrence or relapse of esophageal cancer. This indicates that early detection is the most important factor in gastric tube cancer (*25-27*).

At our hospital, with the understanding that the onset of gastric tube cancer varies from 1 to 30 years after esophagectomy, we now perform lifetime follow-up twice per year, even after five years have elapsed since esophagectomy. In addition, endoscopy is performed by an endoscopist who can accurately diagnose common sites of squamous epithelial cancers, such as tongue cancer and oropharyngeal or hypopharyngeal cancer.

This study has several limitations. First, this is a backward-looking observational study, and it is not a method that adds a high level of evidence as a means of drawing conclusions. Second, there were differences concerning the methods of reconstruction for esophagectomy depending on the background of the period. Third, due to the small sample size, the indicators shown in the tables were not statistically compared between the two groups.

Conclusion

In addition to recurrence and metastasis, gastric tube cancer is often observed after esophagectomy. The present findings highlight the importance of early detection of gastric tube cancer after esophagectomy and that the ESD and EMR procedures are safe and have significantly less complications compared with gastrectomy. Follow-up examinations should be scheduled with consideration given to the most frequent sites of gastric tube cancer occurrence and the time elapsed since esophagectomy.

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