

Comparison of laparoscopic and open gastrectomy for gastric cancer

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Abstract

Background: The role of minimally invasive gastrectomy in the treatment of gastric cancer is not well defined. The aim of the current study was to compare the operative outcomes and adequacy of resection of laparoscopic gastrectomy compared to open gastrectomy for gastric cancer.

Methods: The clinical course of 15 consecutive patients who underwent minimally invasive gastrectomy or esophagogastrectomy for gastric cancer were compared with that of 21 patients who underwent open gastrectomy. Main outcome measures included operative time, blood loss, length of stay, morbidity, 30-day mortality, and adequacy of lymphadenectomy and resection margins.

Results: There was no conversion to laparotomy in the laparoscopic group. Intraoperative blood loss was significantly lower in the laparoscopic group (138 mL vs. 357 mL). There was no significant differences in the mean operative time (244 vs. 241 min.), transfusion rate (6% vs. 29%), median length of stay (6 vs. 7 days), morbidity (7% vs. 24%), or number of lymph nodes harvested (15 vs. 14 nodes) between the 2 groups. Resection margins were negative in all patients. There were no leaks and the 30-day mortality was 0 in both groups. Anastomotic strictures were higher in the laparoscopic patients.

Conclusion: Laparoscopic gastrectomy is feasible and can be performed safely with adequate lymphadenectomy compared with open gastrectomy. © 2006 Excerpta Medica Inc. All rights reserved.

Keywords: Laparoscopy; Gastrectomy; Gastric cancer

Gastrectomy for gastric cancer is a complex gastrointestinal operation that can be associated with high morbidity. The specific type of gastric resection for gastric cancer is based on the location and stage of the cancer. Gastrectomy for gastric cancer has been traditionally performed through an upper midline incision. With the recent advances in minimally invasive surgical techniques, gastric resection has been accomplished by the laparoscopic approach. Although the long-term results of laparoscopic gastrectomy for malignant disease are not evident, laparoscopy has been shown in prospective randomized trials to be an acceptable alternative to open surgery for other gastrointestinal cancer. For example, survival and recurrence rates have been comparable between laparoscopic and open colectomy for cancer [1]. In addition, our group has previously described the feasibility and safety of laparoscopic and thoracoscopic esoph-

agectomy compared to open esophagectomy for esophageal cancer [2,3]. We hypothesize that laparoscopic gastrectomy for malignant disease is feasible, as safe as open gastrectomy and provides similar lymphadenectomy, with some distinct clinical advantages.

Methods

Clinical data on 15 consecutive patients who underwent minimally invasive gastrectomy between June 2001 and March 2006 were collected prospectively on a computerized record. The same data entry form was used to collect clinical information from a retrospective chart review of patients who underwent open gastrectomy for gastric cancer within the same time period (2001 through 2006). Patients who had unresectable disease, underwent nonresectable, palliative procedures, or who did not have gastric adenocarcinoma were excluded from the study.

Main outcome measures included operative time, blood loss, transfusion rate, length of hospital and intensive care unit stay, rate of conversion in the laparoscopic group,

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morbidity, in-hospital and 30-day mortality, specimen margin, wound recurrence, and adequacy of lymphadenectomy. Some of the charts for the open group were not available to establish late complications. All charts for the laparoscopic group were available in our database. Patients were monitored at 3-month intervals for the first year and 6-month intervals for the second year.

Pathology reports from all patients were reviewed for specimen margins, number of lymph nodes harvested, and pathologic staging. The outcomes of patients who underwent minimally invasive gastrectomy were compared with those who underwent open gastrectomy. This retrospective study was approved by the University of California Irvine Medical Center Institutional Review Board.

Data are expressed as means \pm SD. Differences in patient characteristics, blood loss, operative time, length of hospital, and intensive care unit stay were determined using 2-sample Student *t* tests. Differences between groups for categorical data were determined using a 2-sample *Z* test. Statistical analysis was performed using Statistix software, version 8 (Tallahassee, FL). A *P* value of less than .05 was considered statistically significant.

Operative techniques

Table 1 lists the type of gastrectomy for both groups. In the laparoscopic group, operative procedures included distal, subtotal, proximal, and total gastrectomy, as well as Ivor-Lewis esophagogastrectomy.

Laparoscopic distal gastrectomy

This procedure is performed for gastric antral cancer. Five abdominal trocars are introduced. The gastrohepatic and gastrocolic ligaments are divided for gastric mobilization. The right gastric and right gastroepiploic vessels are divided with the linear stapler. The first portion of the duodenum is divided using a 60-mm linear stapler. The site of proximal gastric resection depends on the site of the cancer and its extension. The proximal gastric division line is performed with sequential application of multiple linear staplers (3.5-mm staple load) starting on the lesser curvature of the stomach and completed on the greater curvature, leaving a large gastric pouch. In distal, prepyloric cancers, the left gastric vessels are preserved but a celiac lymphadenectomy is performed. Gastrointestinal continuity is performed in a Roux-en-Y fashion. The jejunum is divided 30 cm distal to the ligament of Treitz. The length of the Roux limb is measured at 40 cm, where a jejunojunctionostomy is constructed using a linear stapler and the jejunal enterotomy is closed with a running non-absorbable suture in two layers. The Roux limb is routed in either an antecolic or

retrocolic position. The gastrojejunal anastomosis is performed with a linear stapler. The surgical specimen is removed atraumatically through an enlarged trocar site that is protected with a plastic wound retractor and the specimen margin is identified.

Laparoscopic subtotal gastrectomy

This procedure is performed for gastric cancer involving the gastric antrum or gastric body. The entire stomach is mobilized including the gastric fundus by division of the short gastric vessels. The first portion of the duodenum is divided with a linear stapler. The left gastric vessels are preserved, but a celiac lymphadenectomy is performed. A small gastric pouch is constructed immediately below the gastroesophageal junction. An anvil is placed into the gastric pouch and secured with a purse-string suture. Gastrointestinal continuity is restored in a Roux-en-Y fashion as described above. The gastrojejunosomy is performed with a circular stapler.

Laparoscopic total gastrectomy

This procedure is performed for patients who have gastric cardia lesion with involvement of the gastric body and antrum. Five abdominal trocars are introduced. The entire stomach is mobilized including the gastric fundus by division of the short gastric vessels. In addition, a celiac lymphadenectomy was performed with division of the left gastric vessels. The first portion of the duodenum is divided with a linear stapler. The distal esophagus is mobilized circumferentially for a segment of 5 to 6 cm into the mediastinum. The esophagus is divided with the ultrasonic scissor approximately 2 cm above the gastroesophageal junction. Gastrointestinal continuity is restored in a Roux-en-Y fashion. The anvil of the circular stapler is inserted into the esophageal stump and secured with a purse-string suture. The jejunum is divided at 30 cm distal to the ligament of Treitz. The length of the Roux limb is measured at 40 cm whereby a jejunojunctionostomy is constructed. The Roux limb is routed either antecolic or retrocolic. A 25-mm circular stapler is used to construct the esophago-jejunal anastomosis.

Laparoscopic proximal gastrectomy

This procedure is performed for cancer of the gastric cardia without involvement of the esophagus. Five abdominal trocars are introduced. The entire stomach is mobilized including the gastric fundus by division of the short gastric vessels. The right gastroepiploic artery is maintained. In addition, a celiac lymphadenectomy is performed with division of the left gastric vessels. The mid-aspect of the stomach is divided starting on the lesser curvature and completed on the greater curvature of the stomach. The distal esophagus is mobilized circumferentially for a segment of 5 to 6 cm into the mediastinum. The esophagus is divided with the ultrasonic scissor approximately 2 cm above the gastroesophageal junction. The anvil of the circular stapler is inserted into the esophageal stump and secured with a purse-string suture. A gastrotomy is created in the distal gastric remnant. An esophagogastric anastomosis is performed using a 25-mm circular stapler. The remaining gastrotomy is sutured closed.

Table 1
Types of laparoscopic and open gastrectomy for cancer

Type of gastrectomy	Laproscopy (n = 15)	Open (n = 21)
Total gastrectomy	2	8
Proximal gastrectomy	4	0
Subtotal gastrectomy	4	11
Distal gastrectomy	2	2
Esophagogastrectomy	3	0

Laparoscopic and thoracoscopic Ivor-Lewis esophagogastrectomy

This procedure is performed for gastric cardia lesions with involvement of the esophagus. Laparoscopic and thoracoscopic Ivor-Lewis resection is performed in 2 stages. In the first stage, the gastric conduit is created laparoscopically with a 3-cm negative margin of resection from the gastric cardia cancer. A celiac lymphadenectomy is performed with division of the left gastric vessels. The gastric conduit is sutured to the esophagogastric specimen. In the second stage, the patient is positioned in a left lateral decubitus position with single lung ventilation. Four thoracic trocars are introduced. The thoracic esophagus is mobilized proximally to the level of the azygous vein, which is divided with a linear stapler. The mediastinal lymph nodes are dissected en-bloc with the esophageal specimen. The surgical specimen is delivered into the right chest, pulling along with it the gastric conduit. The esophagus is divided at the level of the transected azygous vein. The anvil of the circular stapler is inserted into the esophageal stump and secured with a purse-string suture. A gastrotomy is created along the staple-line of the gastric conduit. A 25-mm circular stapler is used to construct the esophagogastric anastomosis and the remaining gastrotomy is sutured closed. The surgical specimen is removed from the thorax through a mini-thoracotomy that is protected with a plastic wound retractor.

Open gastrectomy

All open gastrectomy operations were performed through a midline laparotomy. Operative procedures in the open group included subtotal, total, and distal gastrectomy (Table 1). The operative steps of a particular operation are similar to that described for the laparoscopic approach and only differ with respect to the type of access. Laparoscopic procedures were performed by advanced laparoscopic surgeons, while open procedures were performed by surgical oncologists. Each specialty group performed patient follow-up and treatment of complications. The decision to operate was based on preoperatively resectability criteria by computed tomography scan, esophageal ultrasound, or positron emission tomography scan, or intraoperatively by either laparoscopy or laparotomy.

Results

Fifteen laparoscopic and 21 open gastrectomies were performed for gastric cancer (Table 2). The mean age for the laparoscopic group was comparable to that of the open group. There were more males in both groups and Asian

Table 2
Demographic patients who underwent laparoscopic or open gastrectomy for cancer

Patient characteristics	Laproscopy	Open
No. of patients	15	21
Gender: male (%)	80	62
Race: Asian (%)	65	58
Mean age (y)	64 ± 13	62 ± 13
Median ASA score	3	3

ASA = American Society of Anesthesiologists.

Table 3
Operative data for laparoscopic versus open gastrectomy for cancer

Variable	Lap	Open
Mean operative time (min)	244 ± 95	241 ± 84
Mean blood loss (mL)	138 ± 114	357 ± 286*
Transfusion rate (%)	1 (6)	6 (29)
Median ICU stay (d)	0	0
Median hospital stay (d)	6	7
Mortality (%)	0	0

ICU = intensive care unit.

* *P* < .05, Student *t* test.

patients predominated. The median American Society of Anesthesiologists score was similar between the 2 groups.

Perioperative outcomes of laparoscopic and open gastrectomy are listed in Table 3. The mean operative time was similar between groups. Blood loss was significantly higher in the open group (357 mL vs. 138 mL); however, transfusion rates were comparable between groups. No patient in the laparoscopic group required conversion to a laparotomy. The median lengths of intensive care and hospital stay were comparable between groups. There was no in-hospital or 30-day mortality in either group. In those patients who underwent the laparoscopic and thoracoscopic Ivor-Lewis esophagogastrectomy for gastric cardia cancers, the mean operative time was 328 ± 166 minutes; blood loss was 125 ± 66 mL without transfusion; and the mean intensive care unit stay was 1 ± 0.5 days. The overall median intensive care unit stay was 0 days for both laparoscopic and open group.

Pathologic tumor-node-metastasis (TNM) classification is shown in Table 4. The number of lymph nodes obtained by the surgical pathologist from the surgical specimen was similar between groups (15 ± 9 nodes, laparoscopic vs. 14 ± 9 nodes, open). All resection margins were negative in both groups. In those patients who underwent esophagogastrectomy for gastric cardia cancer, 17 ± 7 nodes were obtained from lymphadenectomy with negative specimen margins. There was no wound recurrence in the laparoscopic group after a median follow-up of 22 months.

Complications after laparoscopic and open gastrectomy are listed in Table 5. Early complications were defined as those occurring within 30 days after gastrectomy. There were no leaks in either group. There was 1 early reoperation in both groups for intra-abdominal bleeding. There were 3

Table 4
Pathologic TNM classification for laparoscopic and open gastrectomy groups

TNM	Laproscopy	Open
Tis	2	1
T1N0	6	5
T1N1	—	1
T2N0	1	2
T2N1	1	4
T3N0	—	2
T3N1	4	5
T4N1	1	1

T = tumor; N = nodes; M = metastasis; Tis = tumor in situ.

Table 5
Early and late complications after laparoscopic and open gastrectomy

Complications	Laproscopy	Open
Early (%)	1 (7)	5 (24)
GI bleeding (%)	1 (7)	1 (5)
Pneumothorax (%)	0	1 (5)
Wound infection (%)	0	3 (14)
Late (%)	7 (47)	4 (19)
Anastomotic stricture (%)	6 (40)	NA
Small bowel obstruction (%)	1 (7)	3 (14)
Large pleural effusion (%)	0	1 (5)

GI = gastrointestinal; NA = not available.

wound infections in the open group and none in the laparoscopic group. Although high, infection rates in the open group were still within expected rates for clean contaminated cases (5% to 15%). All patients received antibiotic prophylaxis with a second-generation cephalosporin.

The majority of late complications consisted of anastomotic strictures at the esophagogastric anastomosis in the laparoscopic group and small bowel obstructions in the open group (Table 6). One late reoperation occurred in the laparoscopic group for a persistent anastomotic stricture. Endoscopic dilatation successfully resolved all other strictures. The stricture rate for the open group was not available. However, the incidence of anastomotic stricture for the open gastrectomy literature is below 10%.

Comments

Minimally invasive surgical techniques for resection of gastric adenocarcinoma are gaining acceptance among surgeons. Laparoscopic gastrectomy for gastric cancer is a complex gastrointestinal operation and it is difficult for most surgeons to obtain experience sufficient to achieve

proficiency. Rather, the laparoscopic surgical techniques for gastrectomy can be learned from the more commonly performed laparoscopic gastrointestinal procedure for the treatment of morbid obesity (gastric bypass). Many surgeons who are performing a high volume of laparoscopic gastric bypass procedure are now able to transfer their technical skills to laparoscopic gastrectomy. In this study, we compared the outcome of patients who underwent laparoscopic gastrectomy to that of open gastrectomy. We found that laparoscopic gastrectomy is feasible and safe, and that it provides an oncologic resection similar to that of open resection.

In our study, laparoscopic gastrectomy was associated with similar operative times and lengths of stay; however, blood loss was significantly lower in the laparoscopic group. Outcomes of laparoscopic compared to open gastrectomy in the literature are variable; however, they are generally in agreement with our findings [4–6]. Reyes et al found that blood loss and length of stay were significantly reduced with the laparoscopic approach; however, operative time was not [5]. The surgical outcome of laparoscopic assisted distal gastrectomy was compared to open gastrectomy by Naka et al [6], who found an increase in operative time but less blood loss in the laparoscopic group. The higher operative time in their study may represent the authors' results during the learning curve for the procedure. Usui et al [7] demonstrated that laparoscopy-assisted total gastrectomy is suitable and feasible for early gastric cancer and has the advantage of shorter recovery time compared to open gastrectomy. Mochiki et al [8] compared outcome of patients who underwent laparoscopic assisted distal gastrectomy to those who underwent open gastrectomy and found that operative time and complications were similar between groups, but blood loss and length of stay were lower in the laparoscopic group. One of the potential benefits of laparo-

Table 6
Studies comparing laparoscopic and open gastrectomy for gastric cancer

Author	Type of gastrectomy	Laproscopy vs. open		Main outcomes for laparoscopic group
		No. of patients	Mortality (%)	
Reyes et al [5]	Distal	18 vs 18	0 vs 0	Less blood loss and shorter LOS; longer Op time, Less blood loss and LOS; longer Op time
Naka et al [6]	Distal	20 vs 22	NA	
Usui et al [7]	Distal	20 vs 19	NA	
Mochiki et al [8]	Distal	89 vs 60	1 vs 5	Less blood loss and LOS; similar Op time
Lee and Han [9]*	Distal	24 vs 23	0 vs 0	
Weber et al [10]	Partial	12 vs 13	0 vs 0	Less blood loss; similar lymphadenectomy; longer Op time
Dulucq et al [11]	Partial, total	24 vs 28	0 vs 3	
Huscher et al [12]	Subtotal	29 vs 30	NA	Shorter LOS; similar Op time and lymphadenectomy
Adachi et al [13]	Distal	49 vs 53	0 vs 0	
Tanimura et al [14]	Proximal, total	60 vs 60	NA	Less blood loss; similar Op time and lymphadenectomy
Shimizu et al [15]	Distal	21 vs 31	0 vs 0	
Hayashi et al [16]*	Distal	14 vs 14	0 vs 0	Shorter time to removal of epidural anesthesia and LOS
Current series	Partial, total, esophago-gastrectomy	15 vs 21	0 vs 0	

LOS = length of hospital stay; Op time = operative time; NA = not available.

* Prospective randomized trial.

scopic approach is the reduction in postoperative pain. In the only prospective randomized trial of laparoscopic versus open gastrectomy, Lee and Han [9] failed to find any differences in analgesic requirements between the 2 groups.

As with other laparoscopic operations for malignancy, concern has been raised about port-site cancer recurrence, adequacy of surgical margins, and the number of lymph node obtained in the resection. The margins of resection of all patients in our study who underwent laparoscopic gastrectomy were free of tumor or metaplasia. It is important to note that we use intraoperative endoscopy to identify the macroscopic proximal and distal extent of tumor involvement before surgical resection. The mean number of lymph nodes retrieved in the laparoscopic group was similar to the number of lymph nodes retrieved in the open group (15 vs. 14 nodes, respectively). Oncologic principles were followed during laparoscopic surgical dissection with minimal direct manipulation of the tumor mass. In addition, all surgical specimens were removed through an enlarged trocar incision that are protected with a plastic wound retractor, as one mechanism for port-site cancer recurrence is direct contact of the tumor at a limited wound extraction site. With a mean follow-up of 22 months, there has been no port-site metastasis observed after laparoscopic gastrectomy. Weber et al [10] similarly demonstrated the adequacy of resection margins, lymphadenectomy and short-term survival in patients who underwent laparoscopic and open distal gastrectomy. In a prospective study comparing outcome of laparoscopic versus open gastrectomy, Dulucq et al [11] reported similar lymphadenectomy between groups, and resection margins were negative in all patients who underwent laparoscopic gastrectomy. In addition, Huscher et al [12] randomized patients to laparoscopic-assisted and open radical subtotal gastrectomy for distal gastric cancer and found that the mean number of resected lymph nodes as well as the 5-year overall and disease-free survival rates were similar between groups. Our study and others have provided evidence to support the adequacy of oncologic resection in laparoscopic gastrectomy compared to open gastrectomy for the treatment of gastric cancer.

In our study, laparoscopic gastrectomy was indeed safe. The morbidity was low without postoperative leak and there were no postoperative deaths. One major complication (gastrointestinal hemorrhage) occurred in both the laparoscopic and open groups. There were more wound infections in the open group. The most common late complication was stricture of the esophagogastric anastomosis, particularly in patients who underwent laparoscopic proximal gastrectomy. These patients with an esophagogastric anastomosis experienced significant gastroesophageal reflux, which we believe contributed to the development of anastomotic stricture. Nevertheless, only 1 patient in the laparoscopic group had a persistent stricture despite endoscopic dilation and required a reoperation. Laparoscopic gastrectomy was also associated with a lower rate of late bowel obstruction compared to open gastrectomy.

In resective surgery for gastric adenocarcinoma, the extent of gastric resection depends on the location of the cancer and extent of invasion. In this study, we have demonstrated that all types of gastric resection can be performed using the laparoscopic techniques. Although small, our se-

ries included patients who had laparoscopic distal gastrectomy, subtotal gastrectomy, total gastrectomy, proximal gastrectomy, and even esophagogastrectomy for gastric cardia cancer with esophageal involvement. The most technically challenging laparoscopic gastrectomy procedures are the laparoscopic total gastrectomy with Roux-en-Y reconstruction and the laparoscopic and thoracoscopic Ivor-Lewis resection. Although only 3 patients underwent esophagogastrectomy in this study, this complex procedure proved to be a safe alternative with minimal blood loss and an acceptable operative time and length of stay.

The extent of resection and lymphadenectomy during gastrectomy for cancer remains controversial. Extended resections and lymphadenectomies (D2 or greater) have not shown to be of survival benefit and have been associated with increase morbidity and mortality [17]. Therefore, we prefer to perform perigastric (D1) lymphadenectomies with wide R0 resection margins (R0 resections: no microscopic evidence of microscopic disease). Although there is lack of data regarding extended resections and lymphadenectomies with the laparoscopic approach, the open data may be extrapolated to the laparoscopic one.

Based on our preliminary experience, minimally invasive gastrectomy appears to be as safe as conventional open gastrectomy. It is likely that minimally invasive gastrectomy can also be applied as a palliative measure in selected patients for unresectable gastric cancer when other endoscopic modalities have failed. Prospective clinical investigations with longer follow-up will be required to answer additional questions, such as the impact of laparoscopy on survival in patients undergoing laparoscopic gastrectomy for cancer. We emphasize that laparoscopic gastrectomy is an advanced technique that requires specific experience, as well as familiarity with conventional esophago-gastric surgery. For now, we recommend that laparoscopic gastrectomy should be undertaken only in centers with experience in open gastric surgery and by surgeons with advanced laparoscopic and thoracoscopic skills.

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Discussion

Dmitry Oleynikov, M.D. (Omaha, NE): This study describes the use of advanced laparoscopic techniques for completion of a variety of oncologically guided laparoscopic gastrectomies in comparison to historical controls that are well matched for age and disease process. The authors describe their technique for performing a variety of gastric resections, including partial gastrectomy, total gastrectomy, and esophageal gastrectomy. To say the least, the laparoscopic technique alone is a tour de force of advanced laparoscopic surgical expertise. The procedures performed include a variety of gastric resections with harvesting of lymph nodes as these operations are being performed for cancers of the stomach. When the authors compare outcomes, it is noted that the laparoscopic group has an overall improved length of stay and less blood loss, and similar oncologic outcomes as reflected by the number of lymph nodes gathered and no evidence of recurrence at the port sites with follow up of 22 months. These are very important considerations since it was thought only recently that laparoscopy could not be an adequate modality for gastrointestinal cancer resections. I commend the authors for bringing forward this important experience. I have several questions. First: do the authors feel that a laparoscopic resection as described by them is the D1 or R1 resection? Do they feel that studies indicating that a D2 or an R2 resection may improve oncologic outcomes? Can you comment on whether a D2 or an R2 resection in your opinion is feasible laparoscopically or necessary? My second question: you describe extracting the specimen through an enlarged incision. Which incision did you choose to extract the specimen through and what did you do with the bulky cancers of the stomach? Were those not attempted laparoscopically or was

a sizable midline or Pfannenstiel incision necessary to remove those? The third question: the authors note that there was a 40% chance of stricture in the laparoscopic approach. They did not find a similar stricture rate in the open approach, although they comment that they did not have adequate clinical follow up on those patients. To what do they attribute the higher incidences of stricture and would they adjust their technique from an EEA 25 anastomotic technique, which they describe, to a linear stapler technique, as you described in your presentation and when that adjustment occur with respect to this particular study.

Norman Estes, M.D. (Peoria, IL): The Will Rogers phenomenon may apply. Since you are from California, I will remind you that Will Rogers said that when people left Oklahoma and went to California, the IQ in both states was improved. Medically that phenomena occurs when you inadequately sample lymph nodes in cancer. If you inadequately stage the disease, the survival differences are not accurately reflected by the stage. And better staging is one of the reasons it is felt the Japanese have a higher cure rate in gastric cancer. In your study, I would be interested to know how you measured stage and type of resection since you say that the R1 resection is in fact the “standard” among Western surgeons. We did a gastric cancer intergroup study and monitored the resections done by American surgeons. Fifty-four percent did RO resections.

J. Esteban Varela, M.D. (Orange, CA): Dr. Oleynikov, as far as the extent of lymphadenectomy resections, it has been proven by multiple clinical trials that D2 resections are associated with increased blood loss, morbidity and mortality without a survival advantage. Most Western surgeons perform a D1 lymphadenectomy with a primary goal of achieving a negative margin of resection. We don’t believe that D2 lymphadenectomy is necessary. The morbidity of a D2 lymphadenectomy is higher than a D1 lymphadenectomy. With regard to the specimen removal, we perform the specimen extraction in our midline port. We extend the wound and placed a protective wound retractor to avoid direct contact of the surgical specimen with the wound site. As far as the stricture rates, we know from our bariatric experience that the use of a circular stapler can lead to a high stricture rate. We have since switched to the use of a 45- to 60-mm linear stapler for construction of the gastrojejunostomy. We haven’t had any stricture problems in the last few cases that we have done a linear anastomosis.

Dr. Estes has made an interesting point. We did not look specifically of the extent of lymphadenectomy. We know by just performing the procedure we stay close to the stomach and we know we perform perigastric lymphadenectomy. That will be the topic for another future study, but I think it is a very important one.