



Contents lists available at ScienceDirect

The American Journal of Surgery

journal homepage: www.americanjournalofsurgery.com

Effectiveness and safety of total laparoscopic distal gastrectomy versus laparoscopy-assisted distal gastrectomy for gastric cancer: A retrospective cohort study[☆]



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ARTICLE INFO

Article history:

Received 28 December 2017

Received in revised form

27 March 2018

Accepted 3 May 2018

Keywords:

Gastric cancer

Total laparoscopic distal gastrectomy

Laparoscopy-assisted distal gastrectomy

Overall survival

ABSTRACT

Aim: To compare the results of total laparoscopic distal gastrectomy (TLDG) and laparoscopy-assisted distal gastrectomy (LADG) and explore the safety and feasibility of TLDG.

Methods: Data were collected and analyzed from patients underwent TLDG and LADG from January 2009 to December 2011 at our institution.

Results: 127 LADG cases and 104 TLDG cases were included and balanced for age, sex, BMI, ASA scores, and CEA level in this study. A decrease in postoperative pain ($P < 0.001$), wound infection rate ($P = 0.013$), and hospitalization time after surgery ($P < 0.001$) was found in the TLDG group. Compared with the LADG group, there was no increase in operative time ($P = 0.084$), intraoperative blood loss ($P = 0.061$), or anastomotic fistula rate ($P = 0.473$). Statistical differences did not exist in recurrence and (or) metastasis ($P = 0.204$), 5-years disease-free survival (DFS) rate and overall survival (OS) ($P = 0.570$ and 0.560 , respectively).

Conclusion: As long as it follows the surgical principles of malignant tumor, TLDG can achieve the same therapeutic effect as LADG does. TLDG is safe and feasible for gastric cancer patients though further studies are needed.

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Gastric cancer is one of the most common malignancies of the digestive system. According to the latest reports,¹ the total incidence of gastric cancer in China was estimated to be 679,100 cases in 2015, ranking first among various malignant tumors in the digestive system. Gastric cancer is localized predominantly at the antrum of the lesser curvature. Compared to open gastrectomy, laparoscopy-assisted distal gastrectomy (LADG), featuring advantages such as reduction of trauma, fewer complications, and faster recovery, has become the most effective treatment for patients with gastric cancer.^{2–5} Moreover, related studies^{6,7} showed that LADG did not reduce survival outcomes. Therefore, LADG has become a mainstream therapy for gastric cancer. In recent years, with the

rapid development and improvement of endoscopic instruments and laparoscopic techniques as well as the development of fast-track surgery practice, total laparoscopic distal gastrectomy (TLDG) has been gradually applied in clinical practice,^{8,9} and the better minimally invasive effects have increasingly aroused more attention from the public. However, at present, little information is available on the feasibility and safety of TLDG. Therefore, we conducted this retrospective study to analyze the effectiveness and safety of TLDG versus LADG to provide evidence for surgeons to perform TLDG.

Materials and methods

General information

Data from patients with distal gastric cancer that were pathologically diagnosed and surgically treated from January 2009 to December 2011 at the Second Xiangya Hospital of Central South University were systematically reviewed. All TLDG and LADG were

[☆] This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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performed by the same group contemporaneously. All patients underwent the same preoperative examinations, including routine blood examination, carcinoembryonic antigen (CEA), chest radiograph, electrocardiogram, pelvic CT, and so on. Anesthetic risk to patients was evaluated by anesthesiologists according to the American Society of Anesthesiologist (ASA) classification. TNM stages were determined according to the 7th edition of the American Joint Committee on Cancer (AJCC) TNM staging system for gastric cancer. Appropriate adjuvant therapy after surgery was developed and performed by oncologists in The Second Xiangya Hospital of Central South University based on the current National Comprehensive Cancer Network (NCCN) guidelines. The follow-up intervals were as follows: every three months for two years after surgery, every six months for two to five years after surgery, and once a year for 5 years after surgery. The last follow-up date was December 2016.

The clinical data of all patients included in the trial were collected and recorded in detail, including age, sex, body mass index (BMI), ASA classification, CEA, duration of surgery, intraoperative blood loss, surgical procedures, method of anastomosis, tumor size, degree of differentiation, pathological pattern, number of lymph nodes retrieved, pathological tumor node metastasis (pTNM) staging, complications, first postoperative exhaust time, postoperative hospitalization duration, and postoperative wounds. Statistical analysis was subsequently performed. The degree of pain was measured with the visual analogue scale (VAS). Disease-free survival (DFS) is defined as the time that passes from the first day of treatment to the date on which the disease progresses or the date on which the patient dies. Overall survival (OS) is defined as the period between the first day of surgery and death. The study was approved by the institutional review board at The Second Xiangya Hospital of Central South University.

Surgical procedures

LADG

After general anesthesia, the patient was placed in a supine position in split-leg position. Following disinfection and draping, routine catheterization was performed. A 12 mm trocar was placed 1 cm below the umbilicus as the observation hole. Two 12 mm trocars were placed 2 cm from the lower left and right ribs in the anterior axillary line, respectively. Two 5 mm trocars were placed 1 cm above the umbilicus in the right and the left midclavicular line, respectively. The surgeon stood on the left side of the patient, the first assistant stood on the right side of the patient, and the camera holder stood between the legs of the patient. The gastrocolic ligament was dissected and the anterior lobe of the transverse mesocolon and pancreatic capsule was stripped. In the root part of the gastroduodenal artery, the right gastroepiploic vessel was disconnected and ligated to dissect the sixth group of lymph nodes. Freeing was performed toward the pylorus continuously. Then, freeing and ligation were performed upward along the greater curvature of the stomach, and the left gastroepiploic vessel was disconnected and ligated to dissect the fourth group of lymph nodes. The serosa of the hepatoduodenal ligament was cut to dissect the twelfth group of lymph nodes. The right gastric artery was dissected and disconnected from the root part to dissect the fifth group of lymph nodes. The pancreatic capsule was stripped to expose the common hepatic artery, splenic artery and celiac axis. The left gastric artery was dissected and disconnected from the root part to dissect the seventh group, the eighth group and the eleventh group of lymph nodes. The lesser omentum was cut, and the right ligament of the cardia was disconnected to dissect the first group of lymph nodes. Freeing was performed towards the pylorus along the lesser curvature to dissect the third group of lymph nodes. Freeing and lymph nodes dissection were completed when

the expected disconnection part was approached. The pneumoperitoneum was released and the front incision exact center at the epigastrium was performed. The incision was protected by the incision protector. The pre-dissected tissues were removed from the abdomen and Billroth-I anastomosis, Billroth-II anastomosis, or Roux-en-Y anastomosis was performed according to the conditions of the patient during surgery. All anastomotic stomas and/or broken ends were treated with interrupted seromuscular suture. The stomach tube was placed in the proper position after the anastomotic stomas were checked to be patent without bleeding or tension. Bleeding was stopped carefully, and the abdomen incision was closed after indwelling drainage. The operation was completed.

TLDG

Procedures for tissue freeing and lymph node dissection were the same as with LADG. After freeing, the descending part of duodenum was freed completely. The gastric body and duodenum were disconnected at least 5 cm from both the proximal and distal parts of the tumor. The specimens were collected in the aseptic bag and placed in the lower abdomen. Incisions were made respectively at the residual stomach and the duodenum stump or the proximal jejunum 8–15 cm from the distal part of the ligament of Treitz. The two arms of the cut stapler were inserted to perform side-to-side anastomosis. Another cut stapler was employed to close the incisions at the residual stomach and the duodenum stump or proximal jejunum to complete the Billroth-I anastomosis or the Billroth-II anastomosis (Fig. 1 [A, B]), or the jejunum was disconnected 20 cm from the distal part of the ligament of Treitz. The side-to-side anastomosis for the residual stomach and the distal jejunum was completed in the same way. Side-to-side anastomosis of the proximal jejunum and the jejunum 35–45 cm from the gastroenteric stoma was performed to complete the Roux-en-Y anastomosis (Figs. 2 and 3). The stomach tube was placed in the proper position after the anastomotic stomas were checked to be patent without bleeding or tension. Bleeding was stopped carefully, and the trocar hole below the umbilicus was extended after indwelling drainage to remove the specimens. The abdomen incision was closed. The operation was completed.

Statistical analysis

All data were analyzed using SPSS (version 21.0). The enumeration data were expressed as mean \pm standard deviation, and statistical analysis was performed with a T-test. The measurement data were expressed in numerical form, and statistical analysis was performed by chi-square test or Fisher's exact test. Survival was analyzed using the Kaplan-Meier method and the log-rank test. A *P* value < 0.05 was considered to have statistical significance.

Results

One hundred thirty-three patients underwent LADG, and 108 patients underwent TLDG. Six patients in the LADG group and 4 patients in the TLDG group were excluded from the study due to the following reasons: 5 patients received neoadjuvant therapy; 3 patients failed to receive adjuvant therapy according to the NCCN guidelines; 2 patients received palliative surgery. Therefore, a total of 127 patients undergoing LADG and 104 patients undergoing TLDG were included.

Comparison and analysis of general data between two groups of patients

One hundred twenty-seven cases were included in the LADG

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