

# Clinical application of laparoscopic continuous interposition jejunostomy with double-tract anastomosis and esophagogastric anastomosis: a retrospective study

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**Abstract. – OBJECTIVE:** The aim of this study was to compare the early clinical outcomes of laparoscopic-assisted proximal gastrectomy with continuous interposition of jejunal cis-peristaltic dual-channel anastomosis and esophagogastric anastomosis.

**PATIENTS AND METHODS:** A retrospective analysis of 130 patients who underwent laparoscopic-assisted radical resection of proximal gastric cancer in the Department of Gastrointestinal Surgery at the Affiliated Hospital of Chengde Medical College between June 2018 and October 2022 was conducted. Continuous interposition jejunal double-channel anastomosis (double-tract anastomosis) was used in 71 patients and esophagogastric anastomosis (esophagogastric anastomosis) in 59 patients. The basic clinical data, preoperative and postoperative clinical test indexes, postoperative complications and improvement of symptoms compared to preoperative ones, basic nutritional status and Visick classification of esophageal reflux symptoms at 6 months after surgery were compared between the two groups. Postoperative contrast images of patients in the continuous interposition jejunal double-tract group were collected and analyzed for the ratio of contrast agent remaining in the stomach to that remaining in the small intestinal channel.

**RESULTS:** A total of 130 cases meeting the criteria were included in this study, including 71 cases involving the double-tract (DT) anastomosis method and 59 cases involving the esophagogastric (EG) anastomosis method. There was no significant difference in preoperative information and perioperative safety between the two groups. Visick score of the DT group was significantly better than that of the EG group.

**CONCLUSIONS:** Double-tract jejunal anastomosis can effectively improve esophageal reflux symptoms after proximal gastrectomy. At the same time, its anastomotic method also improves the nutritional status in the short term compared to the esophagogastric anastomosis and is a more ideal procedure for reconstructing the digestive tract after proximal gastrectomy.

*Key Words:*

Double-tract anastomosis, Esophagogastric anastomosis, Laparoscopic surgery, Gastric cancer.

## Introduction

In China, gastric cancer is one of the leading causes of cancer-related deaths<sup>1</sup>. However, among these causes, the structure of gastric cancer incidence has changed significantly. While the incidence of distal gastric cancer, such as in the sinus and pylorus, is decreasing, the incidence of cancer at locations such as the upper third of the stomach and/or the esophagus-gastric junction (also known as proximal gastric cancer) is increasing rather than decreasing<sup>2</sup>. Proximal gastrectomy is indicated for patients with early adenocarcinoma of the upper third of the stomach or adenocarcinoma of the esophagogastric junction with a tumor size of less than 4 cm<sup>3,4</sup>. However, proximal gastrectomy disrupts the antireflux barrier of the esophagogastric junction, causing reflux esophagitis and reducing the quality of life after surgery<sup>5,6</sup>.

The dual access anastomosis approach reduces postproximal gastrectomy reflux esophagitis and improves the quality of life of patients after surgery<sup>7</sup>. However, in some cases of dual access anastomosis, food intake can “escape” from the jejunal access. Physiological food flows through the remnant stomach into the duodenum and has been reported<sup>8</sup> to be important in preventing postoperative malnutrition in proximal gastrectomy patients undergoing proximal stomach (PG) with double-tract anastomosis (DT) followed by dual access anastomosis. Our group also tried two different reconstruction methods, esophagogastric anastomosis and continuous interposition jejunal cis-peristaltic dual access anastomosis. In partic-

ular, continuous interposition jejunal cis-peristaltic dual-channel anastomosis, which is slightly different from the traditional dual-channel reconstruction method, maximizes the continuity of the jejunum, reduces the problem of blood flow obstruction after jejunal dissection and maximizes the preservation of the continuity of the jejunum. The purpose of this study was to compare the differences between continuous interposed jejunal cis-peristaltic dual-channel reconstruction and esophagogastric anastomosis after proximal gastrectomy, to clarify the advantages of continuous interposed jejunal cis-peristaltic dual-channel anastomosis and to provide a new approach to further address the problem of gastrointestinal (GI) reconstruction after proximal gastrectomy.

## Patients and Methods

### Patients

A retrospective analysis of 130 patients who underwent laparoscopic-assisted radical resection of proximal gastric cancer in the Department of Gastrointestinal Surgery at the Affiliated Hospital of Chengde Medical College between June 2018 and October 2022 was conducted. The patients were classified according to the difference in the reconstruction method used intraoperatively into the continuous interposition jejunal double-tract anastomosis group, referred to as the double-tract anastomosis (DT) group, and the esophagogastric-residual anastomosis group, referred to as the esophagogastric-residual anastomosis (EG) group. The inclusion criteria were as follows: (1) patients diagnosed with gastric malignancy after preoperative gastroscopy and biopsy pathology; (2) tumor located in the upper third of the stomach or adenocarcinoma with tumor diameter  $\leq 4$  cm at the esophagogastric junction. The exclusion criteria were as follows: (1) poor systemic status for surgical intolerance; (2) distant metastasis; and (3) intermediate open surgery. This study was approved by the Affiliated Hospital of Chengde Medical College Review Board (CYFYLL2018002). All patients gave their informed consent.

### Surgical Methods

Patients were taken under static suction compound general anesthesia for laparoscopic-assisted radical resection of proximal gastric cancer. Patients were routinely skin sterilized in the split-legged position, and trocar distribution was performed using the five-hole method, with a

CO<sub>2</sub> pneumoperitoneal pressure of 12 mmHg (1 mmHg=0.133 kPa). All patients in the enrolled group underwent proximal gastrectomy D2 radical surgery in strict accordance with the Japanese gastric cancer guideline<sup>3</sup>, and the intraoperative GI reconstruction was conducted in accordance with the following outline: I. Continuous interposition of jejunal double-channel anastomosis group: (1) A small opening was made in the jejunum at 40 cm from the Treitz ligament, where the opening is the common opening for anastomosis, and a 25.5-mm circular anastomosis body is placed in the direction of the proximal jejunum. The proximal jejunum at 15 cm from the sub opening is anastomosed with the metanephric jejunum at 90 cm from the Treitz ligament and reinforced with plasma muscle sutures. (2) Through the common opening, the anastomotic body is placed in the direction of the distal jejunum, and the distal jejunum at 40 cm from the common opening is anastomosed with the anterior lateral wall of the remnant stomach and reinforced with plasma muscle sutures. (3) Through the common opening, the body of the anastomosis is placed in the direction of the distal jejunum, and the distal jejunum 20 cm from this small opening is anastomosed with a reinforced suture to the broken end of the esophagus. (4) Under direct lumpectomy, a jejunal nutrition tube is placed into the jejunum distal to the jejuno-jejunal anastomosis through the common opening, and a gastrointestinal decompression tube is left in place at the residual gastro-jejunal anastomosis. (5) A linear cutting closure is placed through the main operation hole to close the common opening and strengthen the suture, at which time the jejunum at the common opening can only accommodate the passage of the jejunal nutrition tube. II. In the esophagogastric anastomosis group, procedure was according to the following outline: (1) the specimen is removed through a small incision along the midline of the abdomen, and a small incision is made at the appropriate location in the anterior wall of the residual stomach, into which the body of the anastomosis is placed, and an esophagogastric-anterior wall anastomosis is performed and reinforced with sutures. (2) The jejunal nutrition tube is placed, and the incision in the residual stomach is closed and reinforced with sutures (Figures 1 and 2).

### Observed Indicators

(1) Clinical indicators included age, sex, body mass index, operation time, intraoperative bleeding, time to first postoperative venting, time to first postoperative defecation, time to first post-

**Figure 1.** The jejunal nutrition tube is placed, and the incision in the residual stomach is closed and reinforced with sutures.



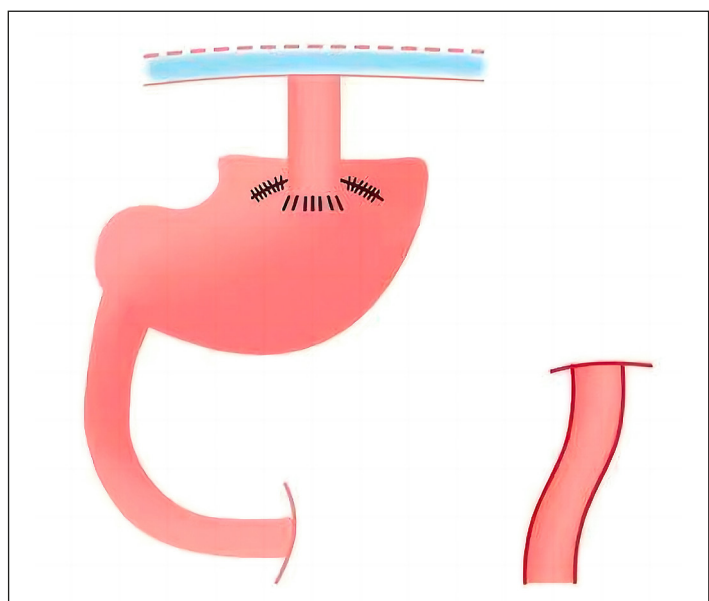
operative transoral feeding, time to postoperative hospitalization, recent postoperative complications such as anastomotic fistula, pulmonary infection, and incisional infection, and long-term postoperative complications such as anastomotic stricture and intestinal obstruction in both groups.

(2) Pathological characteristics: Postoperative pathological staging of patients in both groups was based on the American Joint Committee on Cancer (AJCC), and TNM staging was performed

according to the depth of infiltration, lymph node metastasis, etc. Tumor diameter and tumor differentiation data were also collected to jointly assess whether patients needed follow-up treatment, such as continued chemotherapy after surgery.

(3) Follow-up: Patients were followed up at 6 months after surgery. Complications were recorded based on routine examination results, test results, outpatient records, and admission records. The degree of esophageal reflux symptoms in patients at

**Figure 2.** The jejunal nutrition tube is placed, and the incision in the residual stomach is closed and reinforced with sutures.



6 months postoperatively was obtained by postoperative follow-up collection, and reflux symptoms were diagnosed by a modified Visick score, which classified patients into four levels (I-IV), representing asymptomatic, mildly symptomatic, markedly symptomatic (tolerable), and marked and intolerable, respectively. Postoperative imaging results were collected for patients with continuous interstitial jejunal dual access after DT.

### **Statistical Analysis**

Statistical analysis was performed using SPSS version 26.0 (IBM Corp., Armonk, NY, USA). For continuous variables, the mean  $\pm$  standard deviation was used if the data conformed to a normal distribution, and the median (quartiles) was used to describe the data if they did not conform to a normal distribution; for categorical variables, numbers (percentages) were used to describe the data. Categorical variable information was tested by the Chi-square test. The paired *t*-test was performed for paired measures if they obeyed a normal distribution; if they did not obey a normal distribution, the Wilcoxon signed-rank test was used for comparisons between groups. For unpaired measures, Student's *t* (independent sample *t*-test) test was used if they obeyed a normal distribution, and if they did not obey a normal distribution, Mann-Whitney U test was used for inter-group comparison.  $p < 0.05$  was considered indicative of a statistically significant difference.

## **Results**

### **Baseline Characteristics**

This study comprised a total of 130 cases that met the inclusion criteria, including 71 cases in which the DT anastomosis method was used and 59 cases in which the EG anastomosis method used. There were no significant differences in age, sex, BMI, or tumor differentiation between the two groups, but there were significant differences in postoperative tumor pathology, according to the American Joint Committee on Cancer (AJCC)<sup>9</sup> TNM stage between the two groups. In addition, the proportion of patients with early postoperative pathology was higher in the EG group than in the DT group (Table I).

### **Intraoperative Situation Comparison**

There was no significant difference in operative time or intraoperative bleeding between the two groups. There were no statistically significant

differences in the time to first postoperative evacuation, time to defecation, time to first feeding, or postoperative hospital stay. There were no statistically significant differences in postoperative anastomotic fistula, anastomotic stricture, pulmonary infection, incisional infection, or bowel obstruction complications between the two groups (Table II).

### **Follow-up**

The Visick score was calculated to assess the quality of life in both groups at 6 months after surgery. The results of the analyzed data revealed the following: (1) the number of patients with a score of grade I was significantly higher in the DT group than in the EG group ( $p < 0.05$ ); (2) the number of patients scored as grade II was less in the DT group than in the EG group, and the difference was statistically significant ( $p < 0.05$ ); (3) the number of patients scored as grade III was significantly less in the DT group than that in the EG group ( $p < 0.05$ ); (4) there was no statistical significance difference between the number of patients scored as grade IV in the DT EG groups (Table III).

Differences in preoperative hemoglobin (HGB), albumin (ALB), and total protein (TP) indexes in the two groups did not pass the significance test ( $p > 0.05$ ), and there was no significant difference between the patients' preoperative tests. When we compared the HGB, ALB, and TP indexes of the two groups of patients 6 months after surgery, we found that the levels in the DT group were significantly higher than those in the EG group, and the two groups were different ( $p < 0.05$ ) (Table IV). According to the postoperative flow of contrast agents, the ratio was analyzed from 1:1 to 5:4.

## **Discussion**

Currently, gastric cancer is still a worldwide cancerous disease, and its high incidence and mortality rate still threaten people's health<sup>10</sup>. For proximal gastric cancer, major proximal gastrectomy is preferred with the premise of ensuring negative margins and adequate lymph node dissection<sup>11,12</sup>.

The goal of GI reconstruction after proximal gastrectomy is to restore the motor and physiological functions of the GI tract<sup>13</sup>. The currently recommended methods of GI reconstruction after proximal gastrectomy in the Japanese Gastric Cancer Guidelines<sup>3</sup> are esophagogastric anastomosis and dual-channel anastomosis.

**Table I.** Baseline characteristics.

	DT (n=71)	EG (n=59)	<i>p</i>
Gender (e.g./n%)			
male	58 (81.7%)	46 (78.0%)	0.601
female	13 (18.3%)	13 (22.0%)	
Age (years)	63.465±9.058	61.203±8.187	0.141
Tumor size (cm)	3.510±0.645	3.458±0.608	0.638
Preoperative BMI (kg/m <sup>2</sup> )	23.236±3.022	22.715±3.029	0.33
Degree of tumor differentiation			
Highly differentiated	22 (31.0%)	24 (40.7%)	0.253
meso-differentiation	32 (45.1%)	26 (44.1%)	0.812
under differentiation	17 (23.9%)	9 (15.3%)	0.137
pT category			
T1a	6 (8.5%)	12 (20.3%)	0.051
T1b	1 (1.4%)	2 (3.4%)	0.458
T2	6 (8.5%)	8 (13.6%)	0.475
T3	35 (49.2%)	34 (57.6%)	0.347
T4a	23 (32.4%)	3 (5.1%)	<0.05
T4b	0	0	1
pN category			
N0	27 (38.0%)	30 (50.8%)	0.145
N1	28 (39.4%)	28 (47.5)	0.362
N2	13 (18.3%)	1 (1.7%)	0.002
N3a	3 (4.2%)	0	0.112
N3b	0	0	1
pTNM category			
IA	6 (8.5%)	13 (22.0%)	0.029
IB	3 (4.2%)	5 (8.5%)	0.319
IIA	15 (21.1%)	16 (27.1%)	0.429
IIB	19 (26.8%)	1 (1.7%)	<0.05
IIIA	20 (28.2%)	22 (37.3%)	0.272
IIIB	8 (11.3%)	2 (3.4%)	0.095
IIIC	0	0	1

**Table II.** Operative Index.

Group	DT	EG	<i>t</i>	<i>p</i>
Operation Time (Min)	170.507±31.126	171.695±19.782	0.254	0.8
Intraoperative Blood Loss (ml)	137.747±61.002	151.271±46.057	1.403	0.163
Anastomotic Fistula	4 (2.8%)	5 (8.5%)	2.025	0.078
Anastomotic Stricture	4 (2.8%)	3 (5.1%)	0.035	0.427
Intestinal Obstruction	8 (5.6%)	2 (3.4%)	0.369	0.508
Pulmonary Infection	4 (2.8%)	3 (5.1%)	0.448	0.427
Incision Infection	0 (0%)	0 (0%)	-	1
First Exhaust Time (D)	2.803±0.646	2.881±0.751	0.641	0.523
Time Of First Defecation (D)	4.296±1.142	4.492±0.757	1.127	0.262
First Feeding Time (D)	5.627±0.773	5.746±0.756	0.882	0.379
Hospital Stay (D)	13.39±2.239	13.080±2.693	-0.716	0.475



**Table III.** Visick score.

Group	DT	EG	$\chi^2$	<i>P</i>
I	55 (77.5%)	11 (18.6%)	49.437	0.000
II	12 (16.9%)	31 (52.5%)	18.654	0.000
III	3 (4.2%)	13 (22.1%)	9.469	0.002
IV	1 (1.4%)	4 (6.8%)	2.514	0.115

**Table IV.** Nutritional index.

Group	DT	EG	$\chi^2$	<i>P</i>
Preoperative HGB (g/L)	108.563±21.213	105.966±17.827	-0.746	0.457
6 months after surgery HGB (g/L)	120.169±11.703	112.848±15.208	-0.31	0.002
Preoperative ALB (g/L)	35.538±5.351	34.206±4.073	-1.571	0.119
6 months after surgery ALB (g/L)	39.351±4.036	36.217±4.080	-4.386	0
Preoperative TP (g/L)	60.791±5.536	61.992±5.337	1.251	0.213
TP (g/L) 6 months after surgery	67.489±5.374	64.465±5.731	-3.099	0.002

Esophagogastric anastomosis is currently the most widely used anastomosis method<sup>14</sup>. However, some patients inevitably experience many postoperative discomforts or complications, which can be very serious in some patients, such as reflux esophagitis, anastomitis and stricture obstruction, and malnutrition. Patients are forced to sleep in a semirecumbent position for a long time and to take antireflux and other drugs, not only increasing the economic burden but also seriously affecting the quality of life<sup>15</sup>.

How to reconstruct the GI tract to both maximize the utilization of the gastroduodenal channel and reduce the incidence of reflux esophagitis is a difficult problem, and scholars all over the world have conducted many studies in related fields and tried many methods of GI reconstruction. It has been reported from some studies<sup>16,17</sup> that dual-access reconstruction may reduce the incidence of reflux esophagitis after proximal gastrectomy. However, due to the high technical requirements of dual-access anastomosis, the safety and feasibility of the approach have not been clinically validated by a large amount of multicenter data. In the present study, we analyzed 130 patients undergoing proximal gastrectomy for gastric cancer, of whom 71 patients underwent continuous interposition jejunal cis-peristaltic dual-access anastomosis, and 69 patients underwent esophagogastric anastomosis. The surgical method of the dual-access anastomosis designed in this study was slightly different from that of previous studies<sup>17</sup>. In this study, a continuous interposition jejunal cis-peristaltic dual-access anastomosis was

used, which was designed to ensure maximum continuity and good jejunal blood flow compared to the conventional disconnected dual-access anastomosis method while also conforming to the direction of intestinal peristalsis and reducing the incidence of reflux.

Regarding postoperative nutritional indexes, there was a significant difference between postoperative recovery in the dual access group and recovery in the esophagogastric anastomosis group at 6 months. Although there were patients with malnutrition in both groups, the recovery in the dual-access group was better than that in the esophagogastric anastomosis group. The patient's psychological stimulation due to the disease affects appetite and anorexia, resulting in malnutrition and body wasting over time. In the 6<sup>th</sup> month, we collected HGB, ALB, and TP data by following up with patients and reviewing their basic examination data; the data of patients in both groups improved compared to the preoperative period, and the index levels in the DT group were significantly higher than those in the EG group. This is because the GI reconstruction method used in the DT group led to enhanced food storage and increased the patient's intake; according to the postoperative radiological analysis, the ratio of passing through the residual gastric-duodenal channel to jejunal bypass was 1:1 to 5:4. This is because the GI reconstruction method used in the DT group was able to empty most of the food through the residual gastric-duodenal channel. It is more physiological and helps in the absorption of various nutrients.

Regarding early postoperative complications, anastomotic fistula is one of the most feared early postoperative complications after gastric surgery. The number of anastomoses in the DT group is 3; the number of anastomoses in the EG group is 1. The incidence of anastomotic fistula was higher in the DT group than in the EG group after surgery, but in practice, according to the experimental results, there was no significant difference in the probability of anastomotic fistula between the two groups, and increasing the number of anastomoses in the DT group did not increase the incidence of anastomotic fistula. According to a study<sup>18</sup>, anastomotic tension may be a key factor leading to esophagogastric anastomotic fistula. When performing an esophagogastric anastomosis, the surgeon must consider clean-cut edges and adequate anastomotic distance, which inevitably increases anastomotic tension and, consequently, the incidence of anastomotic fistula. In the DT group, due to the long human jejunum, the continuous interposition jejunal method was used. According to the study<sup>18</sup> connecting the stomach to the esophagus with the jejunum and reducing the tension of the anastomosis after partial removal of the stomach; with the continuous interposition jejunal method, the continuity of the intestinal tube was not damaged, and its blood flow was well maintained, ensuring adequate blood supply to the anastomosis. It has been shown<sup>19</sup> that a rich blood supply to the esophageal jejunal anastomosis can promote anastomotic healing and reduce the occurrence of anastomotic fistula.

Anastomotic stenosis is a common complication of gastric surgery that can be caused by reflux esophageal reflux and failure to follow up on postoperative nutrition in a timely manner<sup>20</sup>. When we performed routine postoperative follow-up and postoperative review, the anastomosis was analyzed according to the patient's symptoms and review results. We found that there was no significant difference in the chance of anastomotic stenosis between the DT and EG groups, and no anastomotic stenosis occurred in the DT group due to an increase in anastomosis. In patients who developed anastomotic stenosis, endoscopic dilation was performed by the gastroenterology endoscopist group; no patients were untreated, and all showed significant improvement in symptoms. However, preoperatively, we informed the gastrointestinal endoscopist about the mode of GI tract reconstruction performed at the time of surgery to facilitate endoscopic treatment<sup>21</sup>. In terms of pulmonary infection and abdominal incision in-

fection, the prolonged operative time in the DT group increased the risk of aspiration pneumonia, but no significant difference was found between the two groups in terms of pulmonary infection based on the comparison of the two data studies. This could be attributed to certain aspects of postoperative care. The nursing group patted the back of the patients to drain sputum, and the family members were instructed to do the same frequently. Members of the medical group instructed the patients to stand on the first day after surgery to avoid the occurrence of prolonged recumbent aspiration pneumonia and encouraged the patients to cough to drain sputum, which reduced the chance of pulmonary infection. No incisional infection occurred in either group. The principle of asepsis was strictly enforced during the operation, incisional protection covers were used for the incision to avoid direct contact between the incision and the specimen, and postoperative disinfection and drug changes were necessary to avoid infection of the incision due to untimely drug changes.

Although postoperative intestinal obstruction occurred, there was no significant difference between the DT group and the EG group in this regard, and the symptoms were significantly reduced after conservative treatment. Theoretically, the stimulation of the intestine was greater in the DT group, but the operator tried to protect the intestine from being affected during the operation, and intestinal rearrangement was performed for the anastomosed jejunal intestine, which reduced the chance of postoperative intestinal obstruction.

The Visick score can be used to monitor the subjective effect of the initial antireflux surgery and can visually reflect the patient's description of reflux symptoms<sup>22</sup>. At 6 months after surgery, there was a statistically significant difference between the Visick scores in the two groups of postoperative patients. The number of patients with scores at grade II and above in the DT group was significantly lower than that in the EG group; the number of patients with scores at grade I in the DT group was more than that in the EG group, indicating that the postoperative esophageal reflux symptoms in the DT group were less severe. Analyzing the possible reasons for this, we considered that the interposed jejunal intestinal canal contained more alkaline substances, which could well neutralize the residual gastric secretions. Moreover, due to the presence of the interposed intestinal canal, the passage length for gastric juice reflux was increased, and the amount of

gastric juice introduced into the esophagus by reflux was significantly reduced under the effect of gravity. The procedure is designed to follow the peristaltic direction of the intestinal tube, and the good peristaltic function of the interposed intestinal tube adds another barrier against reflux. The DT anastomosis method improves the patient's postoperative quality of life.

## Conclusions

We have developed a DT anastomosis that can improve the patient's postoperative quality of life and is a more ideal procedure for the reconstruction of the digestive tract after proximal gastrectomy.

### Ethics Approval

This study was approved by the Affiliated Hospital of Chengde Medical College Review Board Ethical approval number: CYFYLL2018002.

### Informed Consent

All patients gave their informed consent.

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### Authors' Contributions

Conceptualization: Enhong Zhao. Data curation: Ji Yang. Formal analysis: Jianjun Li. Methodology: Shuai Zheng and Yalei Li. Supervision: Xin Zheng and Peng Liu and Rui Su. Writing – original draft: Ji Yang. Writing – review and editing: Ji Yang.

### Availability of Data and Materials

The datasets generated during and/or analyzed during the current study are available from the corresponding author upon reasonable request.

### Conflict of Interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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## References

- 1) Shields PG, Bierut L, Arenberg D, Balis D, Cinciripini PM, Davis J, Edmondson D, Feliciano J, Hitsman B, Hudmon KS, Jaklitsch MT, Leone FT, Ling P, McCarthy DE, Ong MK, Park ER, Prochaska J, Sandoval AJ, Sheffer CE, Spencer S, Studts JL, Tanvetyanon T, Tindle HA, Tong E, Triplette M, Urbanic J, Videtic G, Warner D, Whitlock CW, McCullough B, Darlow S. Smoking Cessation, Version 3.2022, NCCN Clinical Practice Guidelines in Oncology. *J Natl Compr Canc Netw* 2023; 21: 297-322.
- 2) Rawla P, Barsouk A. Epidemiology of gastric cancer: global trends, risk factors and prevention. *Prz Gastroenterol* 2019; 14: 26-38.
- 3) Mikuni H, Boku N. [III. Chemotherapy for Gastric Cancer -Revised Points of the 6th Edition of Japanese Gastric Cancer Treatment Guidelines]. *Gan To Kagaku Ryoho* 2021; 48: 1121-1125.
- 4) Haruta S, Shinohara H, Hosogi H, Ohkura Y, Kobayashi N, Mizuno A, Okamura R, Ueno M, Sakai Y, Udagawa H. Proximal gastrectomy with exclusion of no. 3b lesser curvature lymph node dissection could be indicated for patients with advanced upper-third gastric cancer. *Gastric Cancer* 2017; 20: 528-535.
- 5) Su B, Qin W, Xue F, Wei X, Guan Q, Jiang W, Wang S, Xu M, Yu S. The relation of passive smoking with cervical cancer: A systematic review and meta-analysis. *Medicine (Baltimore)* 2018; 97: e13061.
- 6) Xu Y, Tan Y, Wang Y, Xi C, Ye N, Xu X. Proximal versus total gastrectomy for proximal early gastric cancer: A systematic review and meta-analysis. *Medicine (Baltimore)* 2019; 98: e15663.
- 7) Ji X, Jin C, Ji K, Zhang J, Wu X, Jia Z, Bu Z, Ji J. Double Tract Reconstruction Reduces Reflux Esophagitis and Improves Quality of Life after Radical Proximal Gastrectomy for Patients with Upper Gastric or Esophagogastric Adenocarcinoma. *Cancer Res Treat* 2021; 53: 784-794.
- 8) Yamashita K, Iwatsuki M, Koga Y, Toihata T, Kiyozumi Y, Kuroda D, Eto K, Hiyoshi Y, Iwagami S, Baba Y, Miyamoto Y, Yoshida N, Baba H. Preservation of physiological passage through the remnant stomach prevents postoperative malnutrition after proximal gastrectomy with double tract reconstruction. *Surg Today* 2019; 49: 748-754.
- 9) Ji X, Bu ZD, Yan Y, et al. The 8th edition of the American Joint Committee on Cancer tumor node metastasis staging system for gastric cancer is superior to the 7th edition: results from a Chinese mono institutional study of 1663 patients. *Gastric Cancer* 2018; 21: 643-652.
- 10) Erratum: Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA Cancer J Clin* 2020; 70: 313.
- 11) Tokunaga M, Hiki N, Ohyama S, Nunobe S, Miki A, Fukunaga T, Seto Y, Sano T, Yamaguchi T. Effects of reconstruction methods on a patient's



- quality of life after a proximal gastrectomy: subjective symptoms evaluation using questionnaire survey. *Langenbecks Arch Surg* 2009; 394: 637-641.
- 12) Sun KK, Wu YY. Current status of laparoscopic proximal gastrectomy in proximal gastric cancer: Technical details and oncologic outcomes. *Asian J Surg* 2021; 44: 54-58.
  - 13) Ji JF, Ji X. [Pay attention to digestive tract reconstruction after curative resection of gastric cancer]. *Zhonghua Wei Chang Wai Ke Za Zhi* 2013; 16: 104-108.
  - 14) Kumagai K, Shimizu K, Yokoyama N, Aida S, Arima S, Aikou T. Questionnaire survey regarding the current status and controversial issues concerning reconstruction after gastrectomy in Japan. *Surg Today* 2012; 42: 411-418.
  - 15) Lagarde SM, de Boer JD, ten Kate FJ, Busch OR, Obertop H, van Lanschot JJ. Postoperative complications after esophagectomy for adenocarcinoma of the esophagus are related to timing of death due to recurrence. *Ann Surg* 2008; 247: 71-76.
  - 16) Wang S, Lin S, Wang H, Yang J, Yu P, Zhao Q, Li M. Reconstruction methods after radical proximal gastrectomy: A systematic review. *Medicine (Baltimore)* 2018; 97: e0121.
  - 17) Ahn SH, Jung DH, Son SY, Lee CM, Park DJ, Kim HH. Laparoscopic double-tract proximal gastrectomy for proximal early gastric cancer. *Gastric Cancer* 2014; 17: 562-570.
  - 18) Cui Y, Chen H. The effect of tension on esophagogastric anastomotic wound healing in rats. *J Cardiovasc Surg (Torino)* 2003; 44: 775-778.
  - 19) Reavis KM. The esophageal anastomosis: how improving blood supply affects leak rate. *J Gastrointest Surg* 2009; 13: 1558-1560.
  - 20) Wang L, Xia Y, Jiang T, Li F, Wang W, Zhang D, Xu H, Yang L, Xu Z. Short-Term Surgical Outcomes of Laparoscopic Proximal Gastrectomy With Double-Tract Reconstruction Versus Laparoscopic Total Gastrectomy for Adenocarcinoma of Esophagogastric Junction: A Matched-Cohort Study. *J Surg Res* 2020; 246: 292-299.
  - 21) Kikuchi S, Nemoto Y, Katada N, Sakuramoto S, Kobayashi N, Shimao H, Watanabe M. Results of follow-up endoscopy in patients who underwent proximal gastrectomy with jejunal interposition for gastric cancer. *Hepatogastroenterology* 2007; 54: 304-307.
  - 22) Rijnhart-De Jong HG, Draaisma WA, Smout AJ, Broeders IA, Gooszen HG. The Visick score: a good measure for the overall effect of antireflux surgery. *Scand J Gastroenterol* 2008; 43: 787-793.