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Editorial Board Member of *World Journal of Gastrointestinal Surgery*, Georgios Tsoulfas, AGAF, FACS, FICS, MD, PhD, Professor, Transplant Surgery, Aristotle University of Thessaloniki School of Medicine, Thessaloniki 54124, Greece. tsoulfasg@gmail.com

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The primary aim of *World Journal of Gastrointestinal Surgery* (WJGS, *World J Gastrointest Surg*) is to provide scholars and readers from various fields of gastrointestinal surgery with a platform to publish high-quality basic and clinical research articles and communicate their research findings online.

WJGS mainly publishes articles reporting research results and findings obtained in the field of gastrointestinal surgery and covering a wide range of topics including biliary tract surgical procedures, biliopancreatic diversion, colectomy, esophagectomy, esophagostomy, pancreas transplantation, and pancreatectomy, etc.

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Case Control Study

Optimal choice of stapler and digestive tract reconstruction method after distal gastrectomy for gastric cancer: A prospective case-control study

Zhen Wu, Zhi-Gang Zhou, Ling-Yu Li, Wen-Jing Gao, Ting Yu

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Zhen Wu, Zhi-Gang Zhou, Ling-Yu Li, Wen-Jing Gao, Ting Yu, Department of General Surgery, Yixing Traditional Chinese Medicine Hospital, Wuxi 214200, Jiangsu Province, China

Corresponding author: Zhi-Gang Zhou, MM, Attending Doctor, Department of General Surgery, Yixing Traditional Chinese Medicine Hospital, No. 128 Yangquan East Road, Yicheng Street, Wuxi 214200, Jiangsu Province, China. zzgzhigang537@163.com

Abstract

BACKGROUND

Gastric cancer is the most common cause of cancer-related deaths, and is classified according to its location in the proximal, middle, or distal stomach. Surgical resection is the primary approach for treating gastric cancer. This prospective study aimed to determine the best reconstruction method after distal gastrectomy for gastric cancer.

AIM

To explore the efficacy of different staplers and digestive tract reconstruction (DTR) methods after radical gastrectomy and their influence on prognosis.

METHODS

Eighty-seven patients who underwent radical gastrectomy for distal gastric cancer at our institution between April 2017 and April 2020 were included in this study, with a follow-up period of 12-26 mo. The patients were assigned to four groups based on the stapler and DTR plan as follows: Billroth I (B-I) reconstruction + linear stapler group (group A, 22 cases), B-I reconstruction + circular stapler group (group B, 22 cases), Billroth II (B-II) reconstruction + linear stapler group (group C, 22 cases), and B-II reconstruction + circular stapler group (group D, 21 cases). The pathological parameters, postoperative gastrointestinal function recovery, postoperative complications, and quality of life (QOL) were compared among the four groups.

RESULTS

No significant differences in the maximum diameter of the gastric tumors, total number of lymph nodes dissected, drainage tube removal time, QLQ (QOL questionnaire)-C30 and QLQ-STO22 scores at 1 year postoperatively, and incidence of complications were observed among the four groups ($P > 0.05$).

However, groups A and C (linear stapler) had significantly lower intraoperative blood loss and significantly shorter anastomosis time, operation time, first fluid diet intake time, first exhaust time, and length of postoperative hospital stay ($P < 0.05$) than groups B and D (circular stapler).

CONCLUSION

Linear staplers offer several advantages for postoperative recovery. B-I and B-II reconstruction methods had similar effects on QOL. The optimal solution can be selected according to individual conditions and postoperative convenience.

Key Words: Gastric cancer; Distal radical gastrectomy; Reconstruction of digestive tract; Stapler; Quality of life; Prognosis

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Core Tip: To explore the efficacy of different staplers and digestive tract reconstruction (DTR) methods after radical gastrectomy for distal gastric cancer, 87 patients who underwent radical gastrectomy for distal gastric cancer were assigned to four groups: Billroth I (B-I) + linear stapler, B-I reconstruction + circular stapler, Billroth II (B-II) + linear stapler, and B-II + circular stapler. The analysis of various indicators revealed that the linear stapler has greater advantages in postoperative recovery, and that different DTR methods (B-I and B-II) have similar effects on the long-term quality of life of patients after surgery.

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INTRODUCTION

Gastric cancer is a common malignant tumor of the alimentary system that causes significant morbidity and mortality. The predilection site for the disease is the distal stomach. Surgical resection is the primary treatment for gastric cancer[1]. Digestive tract reconstruction (DTR) is the key to radical gastrectomy for gastric cancer and can influence postoperative recovery and a patient's quality of life (QOL). Among the reconstruction methods, Billroth I (B-I) and Billroth II (B-II) are frequently utilized in clinical practice as they are safe, simple, easy to use, and require only one gastrointestinal anastomosis[2]. Recently, the choice between the B-I and B-II reconstruction methods has been controversial. Some studies suggest that the occurrence of postoperative complications (such as malnutrition and dumping syndrome) in B-I reconstruction is comparatively low; however, the operation process is vulnerable to the tension of the gastroduodenal anastomosis, which is only suitable for distal gastric cancers with small lesions and without pyloric invasion[3]. Although B-II reconstruction is not affected by the tension of the gastroduodenal anastomosis and retains the electrophysiological function of the jejunum, it changes the physiological anatomical structure and increases the potential risk of complications, such as alkaline reflux gastritis[4]. With advancements in mechanical anastomosis technology, mechanical anastomosis has become an important method for DTR. Currently, it mainly includes two categories: linear and circular staplers. However, no consensus has been established regarding the anastomotic effect and safety of different staplers in DTR after radical gastric resection for gastric cancer[5]. Thus, this prospective study aimed to determine the optimal stapler (linear or circular) and DTR (B-I or B-II) method and explore their application in radical gastrectomy for distal gastric cancer to provide a reference for the formulation of clinical surgical schemes.

MATERIALS AND METHODS

General materials

Eighty-seven patients (47 men and 40 women, aged 35–68 years) with pathologically confirmed distal gastric cancer who underwent radical gastrectomy at our hospital between April 2017 and April 2020 were included in this study. They were classified into the B-I and B-II groups according to the surgical procedure. Each group was further subdivided into two subgroups according to whether the type of stapler used was linear or circular. The average follow-up period for all patients was 18.6 mo (range, 12–26 mo). The follow-up deadline was June 2022. The ethics committee of our hospital approved this study.

The inclusion criteria were as follows: (1) With gastric cancer confirmed by postoperative pathological examination[6]; (2) postoperative pathological stages I–III; (3) underwent radical distal gastrectomy (DG); and (4) the type of stapler used was linear or circular and the DTR method was B-I or B-II.

The exclusion criteria were as follows: (1) Poor follow-up compliance; (2) incomplete information on the questionnaire; (3) tumor survival; (4) other systemic malignant tumors; and (5) combination of mental and nervous system diseases and others that can seriously affect the objectivity of the questionnaire or interfere with patients' cognition.

Methods

The enrolled patients were divided into four groups as follows: B-I reconstruction + linear stapler (group A, 22 cases), B-I reconstruction + round stapler (group B, 22 cases), B-II reconstruction + linear stapler (group C, 22 cases), and B-II reconstruction + round stapler (group D, 21 cases). The enrolled patients underwent DTR after gastric cancer lesion resection and lymph node dissection.

In Group A, approximately 70% of the gastric tissue was transected using a linear stapler at the lesser curvature of the stomach approximately 6 cm from the tumor, and the stomach's greater curvature without blood vessels and duodenum was > 3 cm from the tumor. A side-to-side anastomosis of the remnant stomach and duodenum was performed using a linear stapler.

In Group B, a linear stapler was used to disconnect approximately 70% of the gastric tissue from the small curvature of the stomach approximately 6 cm from the tumor, and the avascular area of the stomach's greater curvature was disconnected. The duodenum was disconnected 3 cm from the tumor, and the circular stapler was utilized for end-to-side anastomosis of the residual stomach and duodenum. The gastric stump was cut and closed with a linear stapler to check the unobstructed and tension-free blood supply to the anastomotic stoma and reinforce the anastomotic stoma and duodenal stump.

In Group C, approximately 70% of the gastric tissue was transected using a linear stapler at the lesser curvature of the stomach approximately 6 cm from the tumor, and the stomach's greater curvature without blood vessels and duodenum was > 3 cm from tumor. The jejunum was lifted 20 cm below the ligament of Treitz for side-to-side anastomosis between the residual stomach and jejunum. The output loop, approximately 30 cm below the anastomosis, was a side-to-side anastomosis with an input loop approximately 15 cm from the anastomosis.

In Group D, approximately 70% of the gastric tissue was transected using a linear stapler at the lesser curvature of the stomach approximately 6 cm from the tumor, and the stomach's greater curvature without blood vessels and duodenum was > 3 cm from tumor. The circular stapler was applied for end-to-side anastomosis in the gastrojejunostomy. A 3-0 barbed suture was used to suture the common opening of the jejunum and remnant stomach. The absorbable sutures interrupted the seromuscular layer, reinforced the common opening, and closed the duodenal stumps. Jejunum nutrition tubes were placed in all the patients postoperatively to establish enteral nutrition immediately.

Observation indicators and evaluation criteria

Surgical and pathological indicators included intraoperative blood loss, anastomosis time, operation time, maximum diameter of the gastric tumor, and the total number of lymph nodes dissected.

The postoperative recovery parameters were drainage tube removal time, first fluid diet intake time, first exhaust time, and length of postoperative hospital stay.

The recent postoperative complications included anastomotic stenosis, anastomotic fistulas, abdominal infection, delayed emptying, and fever.

QOL was measured using the QLQ (QOL questionnaire)-C30 and QLQ-STO22 scales developed by the European Organization for Research and Treatment of Cancer to evaluate patients' QOL at 1 year postoperatively[7]. Based on the QLQ-C30 and QLQ-STO22 scoring manuals, the original scale data were converted to 0–100. The CQLQ-C30 scale includes five functions (social, cognitive, role, emotional, and physical), three symptoms (pain, fatigue, nausea, and vomiting), one overall QOL scale, and six individual measurement items (shortness of breath, insomnia, appetite, constipation, diarrhea, and financial difficulties), for a total of 30 items. Higher scores indicated higher QOL. The higher the overall health status and functional scale score, the higher the QOL, which decreased as the symptom scale score increased.

The QLQ-STO22 includes five symptoms (pain, eating restriction, anxiety, dysphagia, and reflux) and four individual items (body image, taste, dry mouth, and alopecia). The items were rated from 1 point (no) to 4 points (many), for a total of four levels[8]. Higher scores indicate lower standards of living.

Statistical analysis

Statistical analyses were performed using SPSS 22.0. Data are presented as mean \pm SD. A one-way analysis of variance was performed to compare multiple groups. The least significant difference *t*-test was used to compare multiple groups. Count data are expressed as [(*n*)] %, and the χ^2 test was used. *P* < 0.05 indicated statistical significance.

RESULTS

Comparison of baseline data of patients in the four groups

No significant differences in the baseline data were observed among the four groups (*P* > 0.05; Table 1).

Comparison of surgical and pathological indices of patients in the four groups

The largest gastric tumor diameter and total number of lymph nodes dissected did not differ significantly among the four groups (*P* > 0.05); however, groups A and C (linear stapler) had significantly lower intraoperative blood loss and shorter

Table 1 Comparison of baseline data of the four groups

	Group A	Group B	Group C	Group D	P value
<i>n</i>	22	22	22	21	
Sex (male/female)	14/8	12/10	11/11	10/11	0.663
Age (yr)	50.36 ± 5.62	51.23 ± 5.48	50.64 ± 5.02	52.24 ± 5.82	0.722
Body mass index (kg/m ²)	22.17 ± 2.52	23.64 ± 2.42	22.17 ± 2.52	22.64 ± 2.41	0.167
Pathologic tumor stage (I/II/III)	10/7/5	9/7/6	8/8/6	9/6/6	0.996
Gastric cancer tissue type (adenocarcinoma/papillary adenocarcinoma/other)	15/4/3	15/3/4	14/4/4	15/2/4	0.983

anastomosis time and operation time than groups B and D (round stapler) ($P < 0.05$; Table 2).

Postoperative recovery of patients in the four groups

The time of drainage tube removal did not significantly differ among the four groups ($P > 0.05$), although the time of first fluid diet intake, first exhaust time, and length postoperative hospital stay of groups A and C were significantly lower than those of groups B and D (round stapler) (Table 3; $P < 0.05$).

Comparison of postoperative QOL of patients in the four groups

The QLQ-C30 and QLQ-STO22 scores did not significantly differ among the four groups at 1 year postoperatively ($P > 0.05$; Tables 4-6).

Recent postoperative complications of patients in the four groups

The main complications include anastomotic leakage, anastomotic stenosis, abdominal infection, dumping syndrome, and emptying disorders. The frequency of complications did not differ significantly between the groups ($P > 0.05$; Table 7).

DISCUSSION

Gastric cancers are typically treated surgically. The surgical procedures generally include tumor resection, lymph node dissection, and DTR. The success of DTR can be evaluated accurately. Guaranteeing not only surgical safety but also considering anatomical reconstruction is necessary[9]. Some studies have demonstrated that gastrointestinal reconstruction affects postoperative digestive tract recovery and nutritional status, which are essential for enhancing QOL postoperatively[10]. Currently, the most commonly used DTR methods in radical gastrectomy for distal gastric cancer are B-I and B-II. Both procedures have advantages and disadvantages, and their clinical applications remain controversial [11]. The B-I type is more aligned with the characteristics of physiological anatomy, can maintain continuity of the digestive tract, and has a low risk of abdominal hernia; however, the operation process of anastomotic tension is high, which increases the risk of anastomotic leakage, thus making it only suitable for distal gastric cancers with small lesions and without pyloric invasion[12]. The advantage of the B-II reconstruction method is that it is not affected by anastomotic tension during the resection of a sufficient size of the stomach and duodenal bulb; however, it allows easy changes in the physiological and anatomical structure, increases exposure to bile reflux gastritis, and is associated with a high incidence of gastric stump cancer[13]. Clinical experience and relevant surveys have demonstrated that the combination of mechanical anastomosis in DTR surgery is conducive to shortening the operation time, thereby improving the safety of the procedure, reducing the risk of postoperative syndromes, and increasing the clinical benefit rate for patients[14]. The application of linear and circular staplers in DTR has been reported worldwide. Jiang has reported that linear and circular staplers have similar efficacy and safety in B-II surgery[15]. Meanwhile, Zeng *et al*[16] has reported that the use of a linear stapler in laparoscopic-assisted DG (B-II anastomosis) has the advantages of shorter operation time, reduced risk of postoperative gastric residual retention, and lower cost, although it may increase the risk of residual gastritis. Because the choice of stapler and DTR schemes in clinical practice has increased, this article further discusses the application of different reconstruction schemes in radical gastrectomy for distal gastric cancer by incorporating examples.

During the course of this analysis, the participants were assigned to four groups based on the stapler type and DTR: B-I reconstruction + linear stapler group (group A), B-I reconstruction + circular stapler group (group B), B-II reconstruction + linear stapler group (group C), and B-II reconstruction + circular stapler group (group D). Although we did not identify any significant differences in intraoperative blood loss, maximum diameter of the gastric tumor, and total number of lymph node dissections among the four groups ($P > 0.05$), groups A and C (linear stapler) demonstrated significantly shorter anastomosis and operative time than groups B and D (circular stapler) ($P < 0.05$). This indicates that the B-I and B-II reconstruction methods did not affect the operation and pathological indicators, whereas the stapler type affected the operation-related indicators; the linear stapler could significantly reduce the anastomosis and operative time. The linear stapler is simple to use and only requires a side-to-side anastomosis between the posterior gastric and jejunal walls. The common opening can be clearly observed, and the presence or absence of bleeding can be determined. The use of a barbed wire to close a common opening is relatively simple. The barbed wire does not require knotting or traction, and

Table 2 Comparison of surgical and pathological indices of patients in the four groups

	Group A	Group B	Group C	Group D	P value
<i>n</i>	22	22	22	21	
Intraoperative blood loss (mL)	120.36 ± 22.67	142.64 ± 30.64	123.23 ± 33.59	139.52 ± 32.84	0.034
Anastomosis time (min)	45.36 ± 3.32	59.23 ± 3.46	46.55 ± 3.17	60.10 ± 3.82	< 0.001
Operation time (min)	258.73 ± 23.78	274.77 ± 24.84	260.50 ± 21.73	276.33 ± 25.26	0.026
Maximum diameter of the gastric tumor (cm)	2.67 ± 0.52	2.54 ± 0.45	2.49 ± 0.52	2.60 ± 0.48	0.605
Total lymph node dissection (times)	29.27 ± 8.86	30.41 ± 8.43	28.27 ± 8.91	29.81 ± 8.07	0.865

Table 3 Postoperative recovery of patients in the four groups

	Group A	Group B	Group C	Group D	P value
<i>n</i>	22	22	22	21	
Drainage tube Removal time (d)	7.82 ± 2.09	7.68 ± 1.70	8.41 ± 2.09	7.76 ± 1.87	0.590
First fluid diet intake time (d)	3.82 ± 0.91	5.14 ± 1.13	3.50 ± 1.01	4.95 ± 1.07	< 0.001
First exhaust time (d)	3.23 ± 0.53	4.23 ± 0.75	3.14 ± 0.56	4.19 ± 0.81	< 0.001
Length of postoperative hospital stay (d)	11.73 ± 1.52	13.55 ± 1.44	11.45 ± 1.77	13.43 ± 1.89	< 0.001

Table 4 Comparison of QLQ-C30 scores of patients in the four groups after surgery

	Group A	Group B	Group C	Group D
<i>n</i>	22	22	22	21
Physical function	76.59 ± 10.46	70.01 ± 11.61	77.82 ± 11.16	74.14 ± 12.41
Role function	85.41 ± 10.01	83.45 ± 13.43	77.82 ± 11.73	84.24 ± 10.60
Emotional function	72.59 ± 9.49	69.95 ± 12.13	73.05 ± 11.32	70.67 ± 10.80
Cognitive function	61.68 ± 9.64	64.36 ± 11.54	63.09 ± 12.01	65.90 ± 10.63
Social function	72.36 ± 13.56	77.77 ± 11.33	78.41 ± 13.90	76.9 ± 13.03
General health function	56.32 ± 14.41	61.55 ± 10.05	59.32 ± 9.55	61.10 ± 12.73
Fatigue function	40.45 ± 6.71	40.95 ± 8.39	45.09 ± 5.94	39.10 ± 8.42

Table 5 Comparison of QLQ-C30 scores of patients in the four groups after surgery

	Group A	Group B	Group C	Group D
<i>n</i>	22	22	22	21
Nausea and vomiting	11.64 ± 3.40	9.91 ± 3.57	12.05 ± 3.62	10.01 ± 4.03
Pain	14.91 ± 3.78	14.23 ± 4.44	14.32 ± 4.11	15.62 ± 3.85
Panting	20.68 ± 4.59	22.41 ± 4.58	22.45 ± 4.59	21.33 ± 4.50
Insomnia	21.59 ± 5.54	21.27 ± 4.95	22.09 ± 4.30	20.19 ± 4.24
Appetite	14.77 ± 4.96	15.77 ± 4.64	16.64 ± 5.47	18.24 ± 5.08
Constipation	19.77 ± 4.30	19.77 ± 5.05	21.18 ± 3.62	19.57 ± 3.94
Diarrhea	24.09 ± 5.86	23.32 ± 4.95	21.95 ± 5.02	23.10 ± 4.58
Financial difficulties	12.18 ± 3.91	13.14 ± 2.90	12.45 ± 3.49	11.48 ± 3.63

Table 6 Comparison of QLQ-STO22 scores of patients in the four groups after surgery

	Group A	Group B	Group C	Group D
<i>n</i>	22	22	22	21
Deglutition	5.55 ± 1.47	5.01 ± 1.38	5.59 ± 1.89	4.76 ± 1.67
Pain	8.18 ± 1.87	7.36 ± 1.76	8.86 ± 2.30	8.62 ± 2.27
Reflux	11.68 ± 3.11	11.82 ± 2.63	12.18 ± 2.11	11.05 ± 2.99
Intake	10.73 ± 2.10	10.18 ± 1.82	10.68 ± 2.10	10.14 ± 1.62
Anxiety	16.41 ± 3.23	16.27 ± 3.06	15.86 ± 2.83	16.62 ± 3.28
Xerostomia	5.05 ± 0.95	4.73 ± 0.94	4.91 ± 0.92	4.57 ± 0.87
Sapidity	6.32 ± 2.06	5.68 ± 1.67	5.91 ± 1.54	6.14 ± 1.77
Soma	7.18 ± 1.82	6.55 ± 1.99	6.64 ± 1.89	7.52 ± 1.97
Alopecia	3.77 ± 0.75	3.73 ± 0.83	4.14 ± 0.71	3.90 ± 0.71

Table 7 Recent postoperative complications of patients in the four groups

	Group A	Group B	Group C	Group D	<i>P</i> value
<i>n</i>	22	22	22	21	
Anastomotic leakage	0	1	0	0	
Anastomotic stricture	1	1	1	2	
Abdominal infection	1	1	1	1	
Dumping syndrome	1	2	1	2	
Emptying dysfunction	2	2	2	1	
Incidence rate (%)	5 (22.73)	7 (31.82)	5 (22.73)	6 (28.57)	0.876

tension is self-sustaining during the suturing process, thereby shortening the operation time and reducing the risk of bleeding. Further analysis of postoperative recovery revealed that the first fluid diet intake time, first exhaust time, and length of postoperative hospital stay were shorter in groups A and C (linear stapler) than in groups B and D (round stapler), indicating that postoperative gastrointestinal function recovered faster after linear stapling.

Liang *et al*[17] proposed that linear and circular staplers are equivalent in terms of postoperative nutritional status, intraoperative general indicators, long-term recurrence rate, and survival rate; however, the recovery of gastrointestinal function after a linear stapler is faster than that after a circular stapler. Considering the results of this study, a linear stapler may be preferable in radical gastrectomy for distal gastric cancer. In our study, postoperative QOL was measured using the QLQ-C30 and QLQ-STO22 scales. Although different combinations of staplers and DTR have advantages and disadvantages in surgery and physiology, no measurable change in patient QOL postoperatively was identified. Tang *et al*[18] has also reported similar effects of B-I and B-II reconstructive techniques on patients' permanent QOL following surgery. Operation can be comprehensively determined according to the doctor's operating habits and the patient's individual situation.

Some studies[19,20] have indicated that the type of anastomosis affects the risk of postoperative complications. The diameter of the linear anastomoses was greater than that of the circular anastomoses. Digestive fluids such as duodenal fluid, pancreatic fluid, and bile can reflux easily to the residual stomach through gastrojejunostomy, changing the acidic environment in the stomach and thereby reducing gastric compliance and motility and increasing the risk of complications such as anastomotic edema and bile reflux. A round stapler anastomosis is relatively small and is prone to residual gastric retention, leading to a relatively high risk of digestive reflux and residual gastritis.

The current study has several limitations. Our analysis revealed no difference in the risk of postoperative complications among the four groups, which may be related to insufficient sample size and low incidence of recent postoperative complications. Further research with a larger sample size is required. Moreover, the laparoscopic approach has proven to be a better option than open surgery in terms of quality of life in the immediate postoperative period. Lee *et al*[21] has reported that Roux-en-Y anastomosis is superior to B-I and B-II reconstruction methods with Braun anastomosis in terms of the frequency of bile reflux, although the two the reconstructive procedures did not significantly differ in terms of postoperative QOL index and nutritional status of patients. Moreover, the widely used circular stapler in open surgery and laparoscopic-assisted surgery has limited clinical applications. This involves complicated operational processes. The use of linear staplers has greatly promoted the development of total laparoscopic surgeries. Compared with the circular stapler, the linear stapler is more convenient to use, easier to insert into the digestive tract, and does not affect the maintenance of pneumoperitoneum pressure during surgery. Therefore, further research is necessary to determine the

best reconstruction method and the optimal stapler for gastric cancer.

CONCLUSION

Linear staplers offer several advantages for postoperative recovery. The B-I and B-II reconstruction methods demonstrated similar effects on patient QOL. The optimal choice can be selected according to the individual conditions and postoperative convenience.

ARTICLE HIGHLIGHTS

Research background

Gastric cancer is the fifth most common and third deadliest cancer worldwide. Surgical resection of gastric cancer depends on the stage at which the disease is diagnosed, extent to which the stomach area is involved, and whether the cancer has spread to nearby lymph nodes or distant organs. Therefore, the best reconstruction method and the optimal stapler for gastric cancer need to be explored further.

Research motivation

Current research has demonstrated that mechanical anastomoses in reconstructive surgery facilitate shorter operative time and reduce the risk of postoperative syndromes. Exploring the optimal stapler and digestive tract reconstruction method for gastric cancer will benefit patients.

Research objectives

To explore the efficacy of different staplers and digestive tract reconstruction method in radical gastrectomy for distal gastric cancer and their influence on prognosis.

Research methods

Eighty-seven patients who underwent radical gastrectomy for distal gastric cancer were included in the study and assigned to four groups based on the stapler and digestive tract reconstruction plan: Billroth I (B-I) reconstruction + linear stapler group (group A, 22 cases), B-I reconstruction + circular stapler group (group B, 22 cases), Billroth II (B-II) reconstruction + linear stapler group (group C, 22 cases), and B-II reconstruction + circular stapler group (group D, 21 cases). The pathological parameters, postoperative gastrointestinal function recovery, postoperative complications, and quality of life were compared among the four groups.

Research results

No significant differences in the maximum diameter of the gastric tumors, total number of lymph nodes dissected, drainage tube removal time, QLQ-C30 and QLQ-STO22 scores at 1 year postoperatively, and incidence of complications were observed among the four groups. However, Groups A and C (linear stapler) had significantly lower intraoperative blood loss and significantly shorter anastomosis time, operation time, first fluid diet intake time, first exhaustion time, and length of postoperative hospital stay than groups B and D (circular stapler).

Research conclusions

Both linear and circular staplers are safe and feasible for use in digestive tract reconstruction; however, linear staplers have greater advantages in terms of postoperative recovery. B-I and B-II had similar effects on patients' quality of life postoperatively.

Research perspectives

A recent study has demonstrated that the laparoscopic approach is a better option than open surgery in terms of the quality of life in the immediate postoperative period. However, the application of linear or circular staplers depends on many factors, such as cancer stage, extent of involvement of the stomach area, and spread of cancer. Further research is necessary to determine the best reconstruction method and the optimal stapler for gastric cancer.

FOOTNOTES

Author contributions: Wu Z participated in the study design, performed the experiments, and drafted the manuscript; Li LY and Gao WJ analyzed the data; Yu T collected the samples and modified the manuscript; and Zhou ZG conceived and supervised the study.

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Country/Territory of origin: China

ORCID number: Zhen Wu 0000-0002-2119-855X; Zhi-Gang Zhou 0009-0002-5311-2076; Ling-Yu Li 0000-0001-8584-1332; Wen-Jing Gao 0000-0001-6885-6946; Ting Yu 0000-0002-4493-1312.

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