Comparison the clinical efficacy and quality of life between uncut Roux-en-Y and Billroth II with Braun anastomosis in laparoscopic distal gastrectomy for gastric cancer patients

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Research Article

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Abstract

Purpose: To compare the clinical efficacy and quality of life between uncut Roux-en-Y and Billroth II with Braun anastomosis in laparoscopic distal gastrectomy for gastric cancer patients.

Method:A retrospective cohort study was performed. clinical data of 200 patients who

underwent laparoscopic distal gastrectomy at the Department of Gastrointestinal Surgery of the Second People's Hospital of Hefei from January 2018 to January 2021 were collected. Of the 200 patients,100 underwent uncut Roux-en-Y anastomosis and 100 underwent Billroth II with Braun anastomosis. The general data, intraoperative and postoperative conditions, complications, and endoscopic evaluation 1-year postoperative were compared. Besides, the quality of life of two groups was also compared using the Chinese version of the European Organization For Research and Treatment of Cancer (EORTC) quality of life questionnaire-Core 30 (QLQ-C30) and quality of life questionnaire-stomach 22 (QLQ -STO22).

Results: There were no significant differences in characteristics between the two groups (P>0.05). All the 200 patients successfully underwent laparoscopic distal gastrectomy without intraoperative complications, conversion to open surgery or perioperative death. There were no significant differences between two groups in operative time, intraoperative blood loss, postoperative complications, time to flatus,time to liquid diet and postoperative hospital stay (P>0.05). Endoscopic evaluation was conducted 1-year postoperative .Compared to Billroth II with Braun group, the uncut Roux-en-Y group had a significantly lower incidences of gastric stasis [(18.6%,16/86) vs. (32.8%,27/82), $\chi2$ =3.76, P=0.042], gastritis [11.6% (10/86) vs.30.5% (25/82), $\chi2$=9.053, P=0.003] and bile reflux [1.2% (1/86) vs. 25.6% (21/82), $\chi2$=22.044, P<0.001], and the differences were statistically significant. The EORTC questionnaire was performed 1-year postoperative, there were no significant differences in the scores of QLQ-C30 scale between the two groups (P>0.05), while the scores of QLQ-STO22 compared to the Billroth II with Braun group, the uncut Roux-en-Y group had a lower pain score (median:8.3 vs 16.7, P=0.029) and reflux score (median: 0 vs5.6, P=0.012), and the differences were statistically significant (P<0.05), indicating milder symptoms.

Conclusion: Both the two anastomosis are safe and reliable in laparoscopic distal gastrectomy for gastric cancer , compare to the Billroth II with Braun anastomosis , the uncut Roux-en-Y anastomosis can reduce the incidences of gastric stasis, gastritis and bile reflux, and improve the quality of life

Introduction

In 1994, Kitano et al [1] first reported a case of laparoscopic-assisted distal gastrectomy ,the mode of gastrectomy has gradually changed from open to laparoscopic-assisted and total laparoscopic and ultimately to Robot-assisted gastrectomy during the past 20 years[2–4].A multicenter trial, the CLASS-01 confirmed laparoscopic distal gastrectomy did not result in inferior disease-free survival at 3-years compared with open distal gastrectomy[5]. In addition to the improved survival, quality of life attracted more attention,the mode of digestive tract reconstruction is considered to be closely related to the

postoperative quality of life[6−8]. However, no definitive consensus is currently available regarding how to choose among the various methods[9−10]. This study retrospectively analyzed the clinical outcomes of uncut Roux-en-Y anastomosis and Billroth II with Braun anastomosis in patients with laparoscopic distal gastrectomy to explore the clinical application value of uncut Roux-en-Y anastomosis.

Methods

Patients

The present study is a retrospective cohort study on consecutive patients who underwent elective laparoscopic distal gastrectomy with a uncut Roux-en-Y anastomosis or Billroth II with Braun anastomosis at the Department of Gastrointestinal Surgery of the Second people's hospital of Hefei from January 2018 to January 2021,This study was approved by the hospital ethics committee, and all patients gave informed consent. Inclusion criteria:(1) 18 to 75 years old, (2)gastric cancer proved by preoperative gastroscopy, CT and pathological and tumor was suitable for laparoscopic distal gastrectomy(3) postoperative pathological diagnosis stage was T1-4aN0-3M0 (according to the AJCC-8th TNM tumor stage), and the margin was negative,(4)Eastern Cooperative Oncology Group(ECOG) physical status score <2 points, and American Association of Anesthesiologists (ASA) grade1 to 3I, (5) no mental illness, (6) able to answer questionnaires independently, (7) patients agreed to undergo laparoscopic distal gastrectomy and signed an informed consent. Exclusion criteria :(1) patients with severe chronic diseases and American Association of Anesthesiologists (ASA) grade >, (2) patients with other malignant tumors, (3) patients suffered from serious mental diseases, (4) patients received neoadjuvant chemotherapy or immunotherapy.

Surgical procedure

Billroth II with Braun anastomosis: After distal gastrectomy, duodenal stump closure,a small opening was made in the jejunum on the antimesenteric border 50 cm away from the Treitz ligament. Another opening was made in the stapling line on the greater curvature side of the gastric stump, an antecolic afferent loop to lesser curvature side-to-side gastrojejunostomy was performed , the prox**imal** and distal jejunum were anastomosed to form a side-to-side jejunojejunostomy 60 mm in length , The anastomotic stoma was established 15 cm away from the Treitz ligament and 45 cm (the efferent loop) away from the gastrojejunostomy anastomosis[figureA][9].

Uncut Roux-en-Yanastomosis :After distal gastrectomy, duodenal stump closure, sideto-side anastomosis is performed on the remnant stomach and jejunum, 25 cm from the ligament of Treitz. Then, side-to-side anastomosis between the jejunum approximately 35 cm from gastrojejunostomy and the jejunum approximately 5 cm from the ligament of Treitz is performed. The intestinal cavity on the input less than 5 cm from the loop gastrojejunostomy anastomosis is closed using 7# silk[figureB][9].

Variables

Variables collection included the characteristics, operative time, estimated blood loss , postoperative outcomes including time of first flatus first feeding postoperative hospital stay, TNM staging and postoperative complications ,Dates were checkups after 1-year postoperative including nutritional indicators (hemoglobin, lymphocyte count, total protein, albumin, and)and gastroscopy (residual retention, residual gastritis, bile reflux) , survival, postoperative recurrence and metastasis were also recorded. Tumor staging was performed according to the 8th edition AJCC/UICC[11],Postoperative complications refer to Clavien-Dindo scoring standard[12].Using the Chinese version of the European Organization For Research and Treatment of Cancer (EORTC) quality of life questionnaire- Core 30 [13] (QLQ- C30) and quality of life questionnaire- stomach 22 (QLQ - STO22) to record the the quality of life of two groups[14].

Statistical analysis

The statistical analysis was performed using the SPSS software package version 23.0 (SPSS Inc. Chicago, IL, USA). Continuous variables with a normal distribution are described as mean ± standard deviation (SD) and were compared by Student's t test, whereas The variables of non-normal distribution are represented by M (P 25, P 75)were compared using the Mann–Whitney U test. Categorical variables are described as percentages,The chi-square test and Fisher's exact test were used to compare the categorical variables. Results were considered statistically significant if a p value < 0.05.

Results

1. There were no significant differences in characteristics between the two groups (all P>0.05),as shown in Table 1, All the 200 patients underwent laparoscopic distal radical gastrectomy, without intraoperative complications, transit laparotomy and perioperative death. There were no significant differences in operative time, intraoperative blood loss, postoperative exhaust time, fluid feeding time, drainage tube extraction time and postoperative hospital stay (all P>0.05). The comparison refer to Clavien-Dindo scoring standard of two groups, there were no statistically significant difference (P > 0.05). Among them, in the uncut Roux-en-Y anastomosis group, duodenal stump leakage occurred in 1 patient and was treated by secondary operation ,cured and discharged ,In the Billroth II with Braun anastomosis group, there was 1 case of anastomotic leakage and 2 cases of duodenal stump leakage. The rest of the complications were cured by conservative methods. In this retrospective study, there was no significant difference in the safety and efficacy of the two anastomosis methods[Table 2].

Table 1 The characteristics of two groups:preoperative and postoperative

	Uncut Roun-en-Y(n=100)	Billroth II with Braun (n=100)	p
Age($\bar{x}$±s)	53.5±9.2	2.9±1.4	0.078
Gender(%)			0.653
Male(n,%)	65(65%)	68(68%)	
female(n,%)	35(35%)	32(32%)	
BMI(kg/m^2$\bar{x}$±s)	23.9±2.9	22.7±3.1	0.680
Tumor size(cm,$\bar{x}$±s)	2.9±1.4	3.1±1.6	0.338
ASA□%□			1.000
I-II	98(98%)	99(99%)	
III	2(2%)	1(1%)	
TNM□%□			0.968
T_1	15(15%)	18(18%)	
T_2	22(22%)	24(24%)	
T_3	38(38%)	40(40%)	
T_{4a}	25(25%)	24(24%)	
N□%□			0.704
N0	44(44%)	39(39%)	
N1	26(26%)	24(24%)	
N2	11(11%)	1616(%)	
N3	19(19%)	21(21%)	
TNM□%□			0.261
I	31(31%)	28(28%)	
II	55(55%)	49(49%)	
III	14(14%)	23(23%)	
Operative time(min,$\bar{x}$±s)	216.0±36.4	205.5±33.2	0.089
Blood loss(ml,$\bar{x}$±s)	107.5±45.2	100.6±41.5	0.294
Time to flatus(d,$\bar{x}$±s)	3.3±1.0	3.4±1.2	0.199
Time to liquid diet(d,$\bar{x}$±s)	5.0±1.8	5.2±2.1	0.740

Postoperative hospital stay(d,$\bar{x}$±s)	7.4±3.2	7.6±3.6	0.892

Table 2 Postoperative complications of two groups

	Uncut Roun-en-Y(n=100)	Billroth II with Braun (n=100)	p
Total(n,%)	24(24%)	25(25%)	0.869
lung infection(n,%)	6(6%)	5(5%)	0.756
abdominal cavity infection(n,%)	2(2%)	3(3%)	1.000
surgical site infection(n,%)	7(7%)	6(6%)	0.774
hemorrhage(n,%)	3(3%)	4(4%)	1.000
anastomotic leakage(n,%)	0(0%)	1(1%)	1.000
duodenal stump leakage(n,%)	1(1%)	2(2%)	1.000
delayed gastric emptying (n,%)	2(2%)	2(2%)	1.000
ileus(n,%)	3(3%)	2(2%)	1.000
Clavien-Dindo			
I-II(n,%)	20(20%)	19(19%)	0.858
III(n,%)	4(4%)	6(6%)	0.516

2. During the 1-year follow-up postoperative , in the uncut Roux-en-Y anastomosis group,3 patients occurred recurrence and metastasis (including 1 case of bone metastasis and died 10 months postoperative , 1 case of liver metastasis, and 1 case of lung metastasis),1 patient died of intracerebral hemorrhage 3 mouths postoperative. In the Billroth II with Braun anastomosis group, 5 patients had recurrence and metastasis (including 2 cases of abdominal metastasis, 1 case of bone metastasis, 1 case of liver metastasis, and 1 case of anastomotic recurrence),1 patient died of coronary heart disease 2 months postoperative and 1 patient died of bone metastasis 8 months postoperative.

In the quality of life questionnaire , there were 86 cases in the uncut Roux-en-Y anastomosis group and 82 cases in the Billroth II with Braun anastomosis group were recorded . There was no significant difference in the scores between the two groups according to the EORTC QLQ-C30 quality of life score scale (all P>0.05), as shown in Table 3. However, the symptoms of pain and reflux were statistically significant differences between the two groups of the EORTC QLQ-STO22 quality of life scale (P<0.05)[Table 4].

Table 3 The QLQ-C30 of two groups 1-year of postoperative[M,P_{25},P_{75}]

	Uncut Roun-en-Y(n=86)	Billroth II with Braun (n=82)	p
Function			
physiological function	93.3（86.7,100.0）	93.3（86.7,100.0）	0.539
role function	100.0（83.3,100.0）	100.0（83.3,100.0）	0.815
emotional function	91.7（83.3（91.7）	91.7（83.3（91.7）	0.918
cognitive function	100.0（83.3（100.0）	100.0（83.3（100.0）	0.299
social function	83.3（66.7（100.0）	83.3（66.7（100.0）	0.616
Single symptom			
dyspnea,	0（0（0）	0（0（0）	0.416
insomnia	0（0（33.3）	0（0（33.3）	0.636
loss of appetite	0（0（33.3）	0（0（33.3）	0.309
constipation	0（0（0）	0（0（0）	0.803
diarrhea	0（0（0）	0（0（33.3）	0.551
financial hardship	33.3（33.3（33.3）	33.3（33.3（33.3）	0.907
Symptom dimension（%）			
fatigue	11.1（0（22.2）	11.1（0（22.2）	0.750
nausea or vomiting	0（0（0）	0（0（0）	0.110
pain	0（0,16.7）	0（0,16.7）	0.747

Table 4 The QLQ-STO22 of two groups 1-year of postoperative[M,P_{25},P_{75}]

	Uncut Roun-en-Y(n=86)	Billroth II with Braun (n=82)	P
Dysphagia	0	0	0.769
Pain	8.3(8.3（16.7）	16.7（8.3（25.0）	0.029
Reflux	0（0（11.1）	5.6（0（11.1）	0.012
Restriction	0（0（8.3）	8.3（0（8.3）	0.178
Anxiety	11.1（0（22.2）	11.1（0（22.2）	0.635

3. 1-year fellow-up , there were no significant differences in nutritional indicators (hemoglobin, lymphocyte count, total protein, albumin and weight between two groups (P>0.05)[table 5]

Table 5 Nutritional indicators of two groups after 1-year postoperative□%□$\bar{x}$±s□

	Uncut Roun-en-Y(n=86)	Billroth II with Braun (n=82)	P
Hemoglobin(g/L,$\bar{x}$±s□)	101.9±16.4	105.2±14.8	0.528
Lymphocytes(×10^9/L,$\bar{x}$±s)	2.02±0.31	1.92±0.21	0.695
Total protein(g/L,$\bar{x}$±s□)	64.5±5.3	67.5±5.8	0.360
Albumin(g/L,$\bar{x}$±s□)	40.9±3.6	38.7±3.3	0.743
Weight(kg,$\bar{x}$±s□)	51.3±4.9	50.4±4.6	0.768

4. A total of 168 patients underwent gastroscopy 1-year postoperative, including 86 in the uncut Roun-en-Y anastomosis group and 82 in the Billroth II with Braunanastomosis group.Gastric stasis occurred in 16 cases (18.6%,16/86) in the uncut Roux-en-Y anastomosis group, and 27 cases (32.8%,27/82) in the Billroth II with Braun anastomosis group, the difference was statistically significant (P=0.042), there were 10 cases (11.6%) and 25 cases (30.5%) of gastritis, respectively, and the difference between the two groups was still statistically significant (P=0.003), 1 case (1.2%) in the uncut Roun-en-Y anastomosis group and 21 cases (25.6%) in Billroth II with Braun anastomosis group occurred bile reflux and the difference between the two groups was also statistically significant (P<0.001). There was no reflux esophagitis in the uncut Roux-en-Y anastomosis group, and 2 cases (2.4%) in the Billroth II with Braun anastomosis group, and there was no significant difference between the two groups (P=0.237).

Table 6 Gastroscopy results of two groups after 1 year postoperative

	Uncut Roun-en-Y(n=86)	Billroth II with Braun(n=82)	p
Gastric stasis (n,%)	16(18.6%)	27(32.9)	0.042
Gastritis(n,%)	10(11.6%)	25(30.5%)	0.003
Bile reflux(n,%)	1(1.2%)	21(25.6%)	<0.001
Reflux esophagitis(n,%)	0(0%)	2(2.4%)	0.237

Discussion

Billroth II with Braun anastomosis aimed to reduce duodenal fluid and bile entering the remnant gastric for reduce the possibility of alkaline reflux gastritis[15], The radionuclide demonstrated the diversion effect of Braun's anastomosis and provided a theoretical basis[16-17]. However, related studies have shown that the anti-reflux effect of Braun anastomosis is limited, and the incidence of alkaline reflux gastritis is still

high[18]. Park et al[19]] reported a high incidence (43.3%)of bile reflux in B-II with Braun anastomosis patients .Therefore, some researchers have proposed that Roux-en-Y or uncut Roux-en-Y reconstruction may be an alternative to with Braun reconstruction[20-21].

On the basis of Billroth II with Braun anastomos ,uncut Roux-en-Y anastomosisis is close without break the proximal jejunum input loop,In 2005, Uyama et al [22] reported laparoscopic uncut Roux-en-Y anastomosis, and found that this anastomosis can effectively reduce the incidence of RSS and improve the quality of life of patients. A prospective study shows that traditional Roux-en-Y anastomosis and uncut Roux-en-Y anastomosis are superior to other anastomosis in preventing bile reflux. In addition, compared with Roux-en-Y anastomosis, uncut Roux-en-Y anastomosis can reduce the incidence of Roux Stasis Syndrome, shorten the time of intraoperative digestive tract reconstruction, and reduce intraoperative bleeding. These studies confirm the safety and reliability of uncut Roux-en-Y anastomosis[23-24].

The uncut Roux-en-Y anastomosisis restricts bile and duodenal fluid from entering the residual stomach and reduces the possibility of alkaline reflux gastritis and esophagitis. Compared with Roux-en-Y anastomosis, uncut Roux-en-Y anastomosis keeps the continuity of jejunum structure, avoids the occurrence of ectopic pacers in jejunum and makes jejunum reverse peristalsis, reduces the occurrence of Roux Stasis Syndrome and improves the postoperative quality of life of patients[25-26].In this study, RSS was not observed in the uncut Roux-en-Y anastomosis group.Gastroscopy was performed 1-year postoperative, the incidence of food retention, residual gastritis and bile reflux were 19.8% vs. 37.0%, 11.6% vs. 34.2% and 1.2% vs. 28.8% in the uncut Roux-en-Y anastomosis group and Billroth II with Braun anastomosis group, respectively,these differences were statistically significant differences($p<0.05$).In addition, there were 2 cases of reflux esophagitis in the B-II with Braun anastomosis group,rate of 2.7%,There was no statistical significance between the two groups($p>0.05$).Quality of life was evaluated by QLQ-C30 questionnaire 1-year postoperative, and there was no statistical significance in all scores($p>0.05$). When evaluated by QLQ-STO22 questionnaire, the scores of pain and reflux symptom in the uncut Roux-en-Y anastomosis group were lower than those in the Billroth II with Braun anastomosis group, and the differences were statistically significant($P<0.05$), indicating that there were fewer reflux and pain symptoms in the uncut Roux-en-Y anastomosis group and relatively good quality of life.In addition, in the B-II with Braun anastomosis group, residual gastritis and bile reflux was indicated in some patients, but no obvious clinical symptoms were found. Therefore, long-term follow-up evaluation of postoperative quality of life in both groups is still needed to obtain reliable evidence.

In this study, the characteristics of patients in the two groups were consistent, and there was no significant difference in the safety of the two anastomosis methods. Although the rate of anastomotic leakage, duodenal stump leakage and Clavein-DindoIII complications in uncut Roux-en-Y anastomosis group was lower than that of Billroth II with Braun anastomosis, the difference was not statistically significant.There was no significant difference in nutritional indexes (including hemoglobin, lymphocyte count, total protein, albumin and body weight) between the two groups 1- year postoperative($p>0.05$).

For the uncut Roux-en-Y anastomosis does not need to disconnect jejunum, the integrity of mesangial vessels is retained, the operation time is shortened, and intraoperative bleeding is reduced. At the same time, the blood supply of jejunum side of anastomosis was guaranteed and the probability of anastomotic leakage was reduced.However, the main problem of uncut Roux-en-Y anastomosis is recalcification of the closure point, which makes the jejunum input loop change from closed to open state, resulting in bile and duodenal fluid reflux into the residual gastric, causing alkaline reflux gastritis and esophagitis, affecting the postoperative quality of life of patients.Some studies[20,21,23] have reported that the incidence of recassation of uncut Roux-en-Y anastomosis is 0~22%, Recanalization was reported mostly with 3 or 4 rows of nail closure device, while recanalization rarely occurred with 6 rows of nail closure device, which may be due to the large pressure of intestinal loop at the closure site. With the expansion of intestinal peristalsis and pressure conduction, the anastomosis nail is deformed and loose, and the recanalization is not firmly closed. However, the 6-row screw closure device adds two rows of screws on the basis of the 4-row screw, which significantly improves the closure effect. However, its high price increases the economic burden of patients to some extent.This research adopts the 7 # silk in the proximal stomach jejunum anastomotic ligation jejunal loops of input 5 cm, ligation tied by appropriate force to ensure that loose thread ligation firm do not slip. 1- year follow up, 86 patients underwent gastroscopy, and some patients underwent upper gastrointestinal iodine-water angiography, recanalization of jejunum input loop was not observed.The main reasons are as follows: 1. The uncut Roux-en-Y anastomosis is pro-peristalsis anastomosis, the peristalsis direction of residual stomach and jejunum is consistent, which reduces the probability of food residue at the blind end of jejunum input loop ,avoids the increase of pressure at jejunum closure, 2. the 7# silk was used to ligation the intestinal,due to the inelasticity of the silk, the expansion of the intestinal wall at the closed place was limited. At the same time, the intestinal wall at the closed place was gradually fibrosis due to ischemia, resulting in atrettage, which further strengthened the firmness of the intestinal wall at the closed place.

Conclusion

The uncut Roux-en-Y anastomosis is superior to B-II with Braun anastomosis in reducing food retention, residual gastritis and bile reflux, and can improve postoperative life quality of patients, which is worth promoting.

Declarations

Ethics approval and consent to participate

This study was approved by the ethics committee of the Second people's hospital of Hefei and all patients agreed to undergo laparoscopic distal gastrectomy and signed an informed consent.

Consent for publication

Written informed consent for publication was obtained from all participants.

Availability of data and material

All data and material are available on reasonable request

Competing interests

All authors declare that they have no competing interests.

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Authors' contributions

GS, ZYF, and BWZ were responsible for obtaining and analyzing data, drafting manuscripts, and making critical revisions.

TDW, YRB, and LL mainly were responsible for technical support, relevant references, and manuscripts structure and grammar.

GS and ZYF were responsible for the conception, design, and review.

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Figures

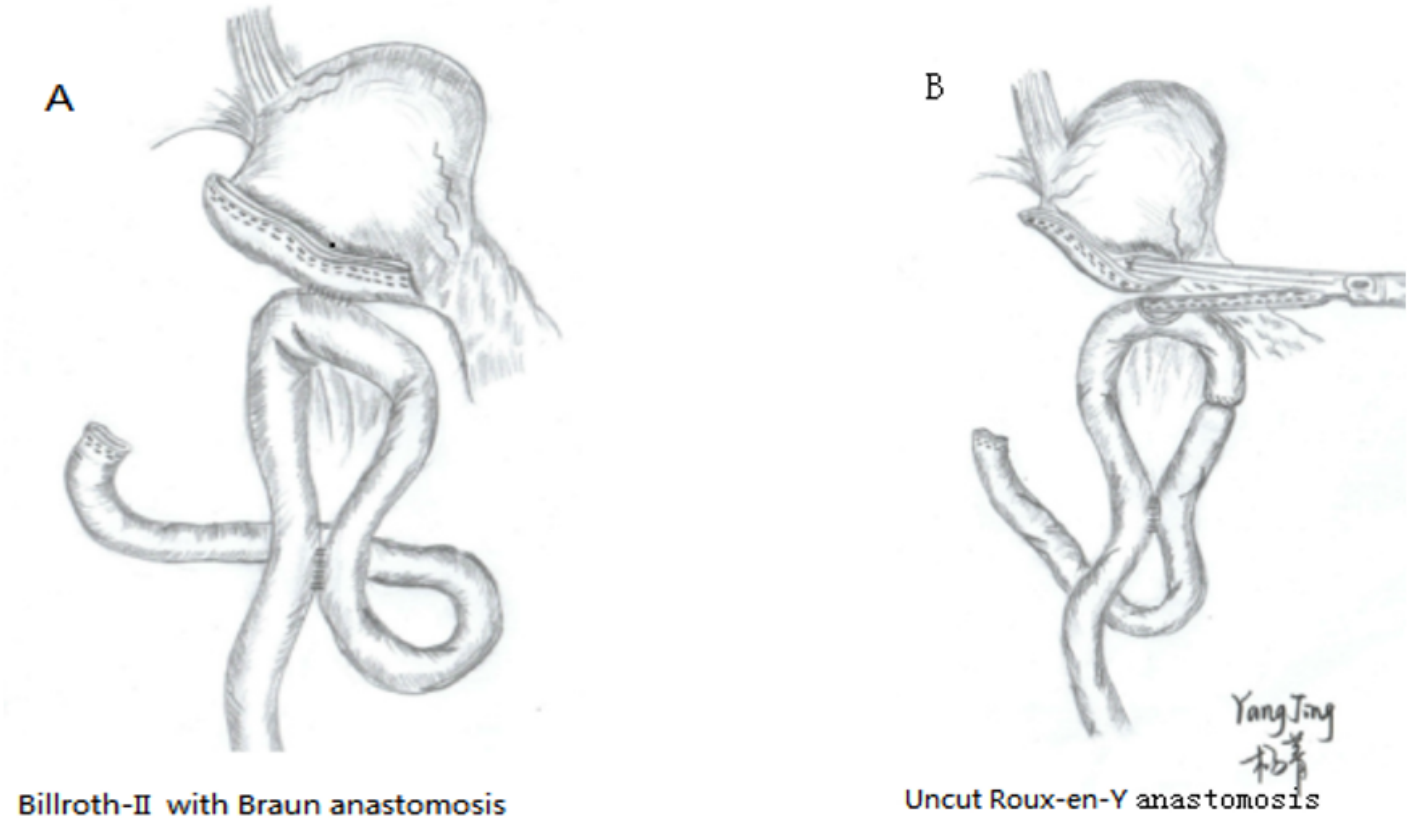

Figure 1

Legend not included with this version