Original Article

Battle Of The Surgeries: Roux-En-Y Vs. Loop Gastrojejunostomy For Benign Gastric Outlet Obstruction A Prospective Cohort Study

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Abstract

Introduction

Gastrojejunostomy is a surgical procedure involving creating an anastomosis between the stomach and the proximal loop of the jejunum. There is a paucity of data comparing the outcome of Roux-en-Y (RY) versus loop gastrojejunostomy (LG) in benign gastric outlet obstruction. Therefore, the current study aimed to assess the pre-, peri-, and postoperative parameters and complications of RY and LG in patients with benign gastric outlet obstruction.

Method

This prospective cohort study was conducted at Hayatabad Medical Complex, Peshawar, Pakistan, between January 2019 and January 2022. The study aimed to assess the outcomes of gastrojejunostomy in patients who chose to undergo the surgery compared to those who chose not to. Patients who needed gastrojejunostomy were included, and those with specific exclusion criteria were excluded. Baseline data were collected, and participants were followed up for two years to assess the outcomes of the treatment. The primary outcome was the incidence of complications related to gastrojejunostomy, and the secondary outcomes included changes in body weight, nutritional status, quality of life, and overall survival. The data were analyzed using appropriate statistical methods and reported according to the STROBE guidelines.

Results

The mean age of the LG group patients was higher than in the RY group ($p<0.0001$). The BMI was slightly higher in the RY group compared to the LG group (23±1 vs 22±1). The time taken by the RY operation was quite high compared to the LG technique ($p<0.0001$). Regarding the postoperative complications, there was no significant difference between the two groups. However, the incidence of biliary gastritis was high in the LG group compared to the RY group, and the difference was statistically significant ($p = 0.008$).

Conclusion

The study compared Roux-en-Y (RY) and loop gastrojejunostomy (LG) in patients with benign gastric outlet obstruction. The results showed that both techniques were safe and effective, but the choice of technique should be individualized based on patient characteristics and surgeon preference. The incidence of biliary gastritis was higher in the LG group compared to the RY group. Further studies are needed to confirm these findings.

Keywords: Roux-en-Y, loop gastrojejunostomy, gastric outlet obstruction

Introduction

Gastric outlet obstruction (GOO) is a disorder in which mechanical obstruction in the distal stomach, pylorus, or duodenum impedes gastric emptying. The patients present with nausea, vomiting, abdominal pain, and early satiety [1]. The etiology of the GOO can be divided into two groups, including mechanical obstruction and motility disorder. The mechanical obstruction to the GOO may occur due to benign or malignant conditions [2]. Much of the GOO is caused by benign diseases. These include peptic ulcer disease (PUD), corrosive ingestion, adult hypertrophic pyloric stenosis, and extraluminal fluid collection. It has been reported that the PUD is most commonly associated with the GOO [3].

Gastrojejunostomy is a surgical procedure involving creating an anastomosis between the stomach and the proximal loop of the jejunum [4-7]. The gastrojejunostomy procedure may be performed either openly or laparoscopically [8]. Anton Woelfer performed the first successful gastrojejunostomy for GOO in 1881 due to pyloric malignancy [9]. A Roux-en-Y surgery (RY) is named after Cesar Roux and involves anastomosing a gastric remnant to a loop of the jejunum and creating an extra jejunojejunostomy [10]. Loop gastrojejunostomy (LG) is most performed for the treatment of GOO. However, the LG is most associated with bile reflux gastritis. To overcome bile reflex gastritis, the RY is the treatment of choice [11-16].

There is a paucity of data on comparing the outcome of Roux-en-Y (RY) versus loop gastrojejunostomy (LG) in benign gastric outlet obstruction. Therefore, the current study aimed to assess the pre-, peri-and postoperative parameters and complications of RY and LG in patients with benign gastric outlet obstruction.

Method

Study design and patients

This prospective cohort study was conducted at Hayatabad Medical Complex, Peshawar, Pakistan, between January 2019 and January 2022. The study sample included all the patients who needed a gastrojejunostomy and were referred to the surgical department. Informed consent was taken from each patient before enrollment in the study. Patients with ages less than 18 or greater than 75, severe psychiatric diseases, or who were unwilling to participate were excluded.

The eligible patients were divided into two groups based on their choice of treatment: those who chose to undergo gastrojejunostomy (the intervention group) and those who chose not to undergo the surgery (the control group). The patients were followed for two years to assess the outcomes of the treatment.

Baseline data, including demographic information, medical history, and clinical examination findings, were collected from all the participants. Follow-up visits were scheduled at 6, 12, 18, and 24 months after the intervention. During the follow-up visits, the participants underwent a clinical examination and relevant investigations as deemed necessary.

The primary outcome of the study was the incidence of complications related to gastrojejunostomy, including postoperative infection, bleeding, and anastomotic leakage. The secondary outcomes included changes in body weight, nutritional status, quality of life, and overall survival.

The collected data were analyzed using appropriate statistical methods to determine the association between the intervention and outcomes. The findings of the study were reported according to the STROBE guidelines.

Intervention techniques

LG was performed by creating an anastomosis between the gastric and jejunum. The purpose of the LG was to reroute the stomach content to the small intestine directly. A posterior row of vicryl 3/0 sutures was used to join the stomach and jejunum. The jejunum and stomach were then opened by electrocautery, resulting in jejunal and gastric stomas. An anteriorly carried, full-thickness, continuous absorbable suture was used to accomplish the inner layer of the anastomosis. The front section of the two-layer gastrojejunostomy was then completed with interrupted vicryl 3/0 sutures. For RY, the Roux limb was separated 20 cm distal to the Treitz ligament, and a gastrojejunostomy was done between the jejunum and stomach remnant. Then, a side-to-side or end-to-side jejunojejunostomy was performed around 40 cm distal to the gastrojejunostomy.

Outcomes

The outcome variables were perioperative parameters, including operation time and blood loss. Surgical site infection, anastomotic leak, and bleeding were among the early postoperative complications. The late postoperative bleeding, or "dumping syndrome," gastric ulcers, delayed gastric emptying, and biliary gastritis were assessed six months after surgery, measured by medical history taking and examination with relevant investigations. The biliary gastritis and delayed emptying were assessed six months after surgery, measured by medical history taking and examination.

Sample size

The sample size was determined using data from previous studies. Considering a power of 80%, a 2-sided significance level of 5%, and an attrition rate of 10%, the total sample size of the study was 50 patients (25 in each arm).

Statistical analysis

SPSS version 25.0 was used to analyze the data. For descriptive analysis, mean, standard deviation, frequency, and percentage were reported. For quantitative data, the student t-test was employed to compare groups. The chi-square or Fischer's exact test was employed to determine qualitative parameters. The statistical significance threshold was set at 0.05.

Results

A total of 50 patients were observed for the current study. The mean age of the LG group patients was higher than in the RY group (p<0.0001). The BMI was slightly higher in the RY group compared to the LG group (23±1 vs 22±1). However, the difference was not significant. The details can be seen in Table 1.

Table 1. Demographics and baseline characteristics of the patients (preoperative).

		LG	RY	P-value
		Mean ± SD/ n (%)	**Mean ± SD/ n (%)**	
Age (years)		59±5	52±3	<0.0001***
Gender	Male	16 (55.2)	13 (44.8)	0.56*
	Female	9 (49.9)	12 (57.1)	
BMI (kg/m^2)		22±1	23±1	0.08***
ASA class	I	18 (47.4)	20 (52.6)	0.74*
	II	7 (58.3)	5 (41.7)	
Comorbidities	Renal failure	1 (50)	1 (50.0)	0.88**
	Liver failure	2 (66.7)	1 (33.3)	
	Diabetes Mellites	3 (37.5)	5 (62.5)	

Surgery indication	Peptic ulcer	5 (71.4)	2 (28.6)	0.52**
	corrosive ingestion	3 (50)	3 (50.0)	
	adult hypertrophic pyloric stenosis	17 (45.9)	20 (54.1)	

* chi-square test, ** fisher exact test, *** independent t-test, LG - Loop gastrojejunostomy, RY - Roux-en-Y

The time taken by the RY operation was quite high compared to the LG technique ($p<0.0001$). There was no significant difference in blood loss, as shown in Table 2.

Table 2. Assessment of the perioperative parameters in both groups

	LG	RY	P-value
	Mean ± SD	**Mean ± SD**	
Surgery duration (min)	149±5	166±2	<0.0001***
Blood Loss (ml)	254±6	256±10	0.42***

*** independent t-test, LG - Loop gastrojejunostomy, RY - Roux-en-Y

Regarding the early postoperative complications, there was no significant difference between the two groups. Moreover, in the late postoperative complications, the incidence of biliary gastritis was significantly higher in the LG group compared to the RY group ($p = 0.008$). Moreover, the gastric ulcer was more prevalent in the LG group compared to the RY group ($p = 0.017$). The details can be seen in Table 3.

Table 3. Assessment of the early and late postoperative complications in both groups.

		LG	RY	P-value
		N (%)	**N (%)**	
Early postoperative complications	Bleeding	2 (40)	3 (60)	0.63**
	Anastomotic leak	2 (33.3)	4 (66.7)	0.38**
	Surgical site infection	2 (66.7)	1 (33.3)	0.55**
Late postoperative complications	Diarrhea	3 (75)	1 (25)	0.29**
	Dumping syndrome	2 (66.7)	1 (33.3)	0.55**
	Vomiting	4 (57.1)	3 (42.9)	0.68**
	Gastric ulcer	9 (81.8)	2 (18.2)	0.017**

	Delayed gastric emptying	5 (62.5)	3 (37.5)	0.44**
	Biliary gastritis	10 (83.3)	2 (16.7)	0.008**

** fisher exact test, LG - Loop gastrojejunostomy, RY - Roux-en-Y

Discussion

The current study compared the LG and RY in terms of pre-, peri-, and postoperative parameters and complications. The current study showed that the surgery duration was significantly less in LG compared to RY. However, there was no significant difference in blood loss across the group. There was no significant difference between the two groups regarding postoperative complications. However, the anastomotic leak was recorded in four patients following RY surgery as an early postoperative complication. Furthermore, in the late postoperative complications, the LG had a higher ratio of biliary gastritis, diarrhea, and delayed stomach emptying than the RY, although the difference was not statistically significant.

Prior studies validated our results on the differences in surgery duration. Cui et al. reported surgery durations of 157.3 and 134.6 minutes in the RY and LG groups, respectively, which demonstrate a statistically significant difference [17, 18]. Choi et al. and Lirong et al. have obtained comparable results regarding the duration of the procedure [17, 19, 20]. Tran et al. also observed that there was a statistical difference between the two groups regarding blood loss [21]. Consistently, Jiang et al. likewise observed no difference between the two techniques in intraoperative blood loss [22].

Theoretically, late and persistent complications following surgery may result in malnutrition, prolonged hospital admissions, readmission, greater illness expenses, and a decline in life quality [23-25]. Regarding the postoperative complication in our study, there was no significant difference. However, an anastomotic leak was reported in four patients undergoing the RY procedure as an early postoperative complication. Moreover, in the late postoperative complications, the ratio of diarrhea and delayed gastric emptying was higher in the LG compared to the RY, but the difference was not statistically significant. These findings were consistent with the previously reported studies, showing no statistical difference between the LG and RY in postoperative complications [17, 26].

The treatment of GOO resulting from benign diseases has been documented using a variety of approaches. Open GJ was formerly the only way to alleviate GOO. Since the advent of endoscopic stenting and laparoscopic surgery, less invasive techniques have been used more often [27]. In this research, we evaluated loop and RY gastrojejunostomy as a therapeutic technique for GOO at our hospital, showing that the RY approach was associated with fewer postoperative complications. However, most importantly, there was a significant difference between the two groups with regard to biliary gastritis and gastric ulcer. Previously, it has been reported that RY is the only option to overcome postoperative gastritis complications [28]. The present study was also in line with this study, highlighting a low incidence of biliary gastritis.

Our study has several limitations, which should be revised in future studies. The first limitation was the low number of patients that participated in the current study. This low number of patient participants may challenge the study's external validity. Larger sample sizes can help overcome this limitation in future studies. The second limitation was that most patients had undergone surgery because of GOO, and the impact of other indications on complications has not been extensively studied.

Conclusion

In conclusion, this study aimed to assess the pre-, peri-, and postoperative parameters and complications of Roux-en-Y (RY) versus loop gastrojejunostomy (LG) in patients with benign gastric outlet obstruction. The study found that the mean age of the LG group patients was higher than that of the RY group, and the BMI was slightly higher in the RY group compared to the LG group. The time taken by the RY operation was also quite high compared to the LG

technique. However, there was no significant difference between the two groups in terms of postoperative complications. Interestingly, the incidence of biliary gastritis was high in the LG group compared to the RY group, and the difference was statistically significant. Therefore, based on these findings, it can be concluded that both RY and LG techniques are safe and effective for the management of benign gastric outlet obstruction. However, the choice of technique should be individualized based on patient characteristics, surgeon preference, and resources available. Further studies with larger sample sizes and longer follow-up periods are needed to confirm these findings.

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