

# Feasibility and outcomes of laparoscopic proximal gastrectomy with Kamikawa double-flap reconstruction for upper - third gastric cancer

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## Abstract

**Introduction:** Laparoscopic Proximal Gastrectomy (LPG) is a priority selection for early cancer, submucosal tumor in the cardia location. However, the optimal method for reconstruction of intestinal circulation is still debated, especially regarding post-operative life quality. This study aimed to evaluate the feasibility, result and post-operative quality of life of a LPG with double-flap technique for reconstruction of digestive tract using Kamikawa technique - double flap (DFT).

**Patients and method:** A retrospective study was performed on 18 patients with early cancer, submucosal tumors in the 1/3 upper or cardia location undergoing LPG – DFT Kamikawa technique 5/2018 to 4/2022 at Digestive Surgery Department, University Medical Center, HCMC. We evaluated clinical data and operation results.

**Results:** Median age was 52 years. The operating time was 265 minutes, and the mean time to perform anastomosis was 85 minutes. There were 4 with early-stage adenocarcinoma, 10 patients with GIST, and 4 with leiomyoma. All cases were free of cancer cells in the surgical resection specimens. There were no intraoperative complications or postoperative complications. There was no postoperative mortality. The mean follow-up time was 20,3 months. Quality of life improved over time: the scores at 6, 12, and 24 months were:  $25.7 \pm 11.6$ ,  $21.3 \pm 6.2$ , and  $19.6 \pm 3.9$ , respectively. The average hospital stay was 6,3 days.

**Conclusions:** LPG –DFT by Kamikawa technique is safe, feasible and patients quality of life were acceptable.

**Keywords:** Gastric cancer, proximal gastrectomy, double-flap reconstruction, Kamikawa

## Introduction

Gastric preservation surgery has been used in early gastric cancer cases for decades. Studies have demonstrated benefits in terms of nutritional status, weight, and quality of life after surgery. Proximal gastrectomy is indicated for early-stage cancer in the upper third of the stomach or submucosa (GIST, leiomyoma, etc. e gastric cardia [1], [2], [3], [4], [5].

Reconstruction of the digestive tract after proximal gastrectomy is controversial. Direct esophago-gastric anastomosis has a high rate of reflux esophagitis (25 - 47%). Using an isolated jejunal loop often reduces gastric emptying and the incidence of anastomotic stricture by 10 - 25%. Meanwhile, the double-tract technique is often complicated, and the postoperative function is unclear [6], [7], [8], [9], [10].

The technique of direct oesophagojejunostomy, according to Kamikawa (double flap technique - DFT) performed since 1998, showed many advantages, especially significantly reducing the rate of reflux esophagitis. However, this method is challenging to implement, there are few studies in the world, so the evidence is not much, especially regarding the quality of life after surgery [1], [11].

At the Digestive Surgery Department, University Medical Center, HCMC, we have performed a resection of the proximal stomach and restored the digestive tract according to the Kamikawa technique since May 2018. The purpose of this study is to evaluate the feasibility, safety and effectiveness of patients post-operative quality of life.

## Patients and methods

**Design research:** a retrospective, descriptive

**Research subject:** Patients with early gastric cancer in the upper third of the stomach or lesions (GIST, leiomyoma ...) in the gastric cardia are indicated for laparoscopic proximal gastrectomy (LPG) and DFT of Kamikawa at the Digestive Surgery Department, University Medical Center, HCMC, from May 2018 to April 2022.

**Operation procedures:**

The patient is in a supine position, on the

right side of 15 degrees, with legs apart and head elevated. The main surgeon stands on the patients right side, the assistant surgeon stands opposite, and the camera holder stands between the patient's legs. Five trocars were used, including one 10 mm trocar in the umbilicus, one 12 mm trocar in the right hip region, and three 5 mm trocars in the right, left hypochondrium, and left hip. First, we moved and showed the left lobe of the liver to the right to expose the gastro-oesophageal junction. Partial resection of the greater omentum was performed approximately 4 cm from the anastomosis between the right and the left gastric artery along the greater curvature of the stomach. In the case of adenocarcinoma, we harvested lymph nodes (group #1, #2, #3a, #4sa, #4sb, #7, #8a, #9, #11p) according to the guidelines of the Japanese Gastric Cancer Association 2014, 2018 [12]. The abdominal esophagus was transversed with a linear splicer (Linear Stapler). Then, we made a small incision around the umbilicus to remove the specimens, cut the proximal part of the stomach and created double flaps between the submucosa and the muscular layer of the anterior gastric wall, separated from the surface of the stomach about 3-4 cm. Each muscle flap has a width of 1.5 cm and a length of 3.5 cm. After creating the sphincter flap, we performed the gastro-oesophageal anastomosis through laparoscopic surgery. The posterior wall of the esophagus is fixed to the upper edge of the stomach by sutures in 4 to 5 separate stitches. We then opened the gastric mucosa and submucosa just above the lower edge of the flap to a length equal to the width of the esophagus. We used continuous sutures to connect the posterior wall of the esophagus to the mucosa and submucosa of the posterior aspect of the flap, and the anterior wall to the entire anterior layer of the stomach. Finally, the two flaps were sutured together to cover the anastomosis and lower esophagus, the entire anastomosis lying in the submucosa of the stomach (Figure 1).

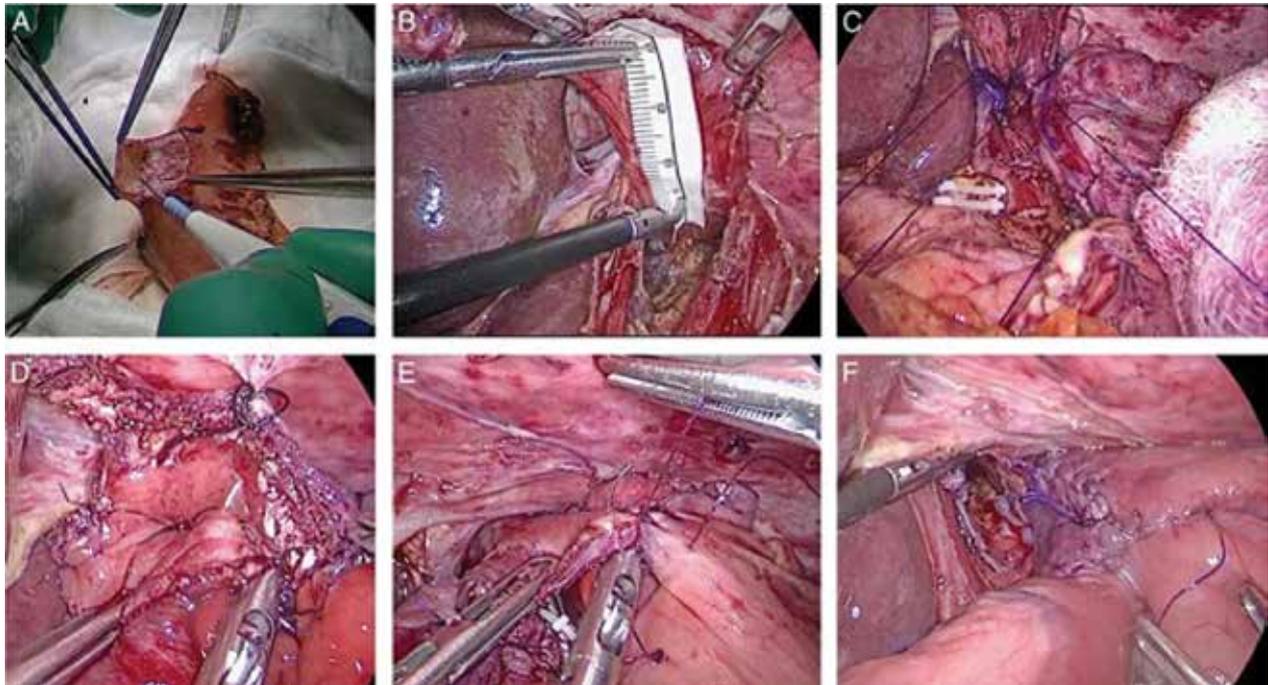


Fig.1. A: Dissection created double flap; B: Measure a distance of 5cm from esophagus cut line; C: fixation of the back of stomach to the esophagus; D: Connect the back of stomach (mucosa and submucosa) to the back of esophagus; E: Anterior connection of the stomach to the anterior of the esophagus; F: Connection after completion

### ***Patient assessment and follow-up***

Preoperative data were collected, including: patient characteristics, tumor type, intraoperative characteristics (blood loss, operative time, technical success), postoperative complications (related and non related to anastomosis), length of hospital stay, and early mortality (death within 30 days after surgery). Technical success was defined as a successful surgical procedure without significant complications or conversion to open surgery.

All postoperative patients were followed up every 3 months for the first 2 years and every 6 months for the next 3 years. Gastroscopy is performed at 6 months, one year postoperatively, or as needed to evaluate for late complications (anastomosis stenosis, anastomotic ulcer, anastomotic fistula, or gastric ulcer) and gastroesophageal reflux. Gastric stasis, degree of gastritis and bile reflux were assessed according to the RGB classification. The Los Angeles classification is used to evaluate reflux esophagitis. Computed tomography of the thorax

and abdomen is performed annually after surgery or when suspected to detect recurrence or metastasis.

The quality of life of patients was assessed after 6, 12 and 24 months using the Gastrointestinal Symptom Rating Scale (GSRS). This is a tool dedicated to gastrointestinal disease with 15 entries. Each item is rated on a Likert-type scale (from 1 to 7) where 1 point is for patients without symptoms and 7 points is for the most bothersome symptoms. The two signs of abdominal pain and dyspepsia were combined into the functional dyspepsia scale [13].

### **Results**

From 5/2018 to 4/2022 at the Digestive Surgery Department, University Medical Center, HCMC, there were 18 cases (including; 4 patients with 1/3 early gastric cancer, 10 patients with GIST and 4 patients with cardiac leiomyoma) underwent LPG - DFT. The mean age was 52 years (the youngest was 36 years old, and the oldest was 80 years old). Preoperative patient characteristics are shown in Table 1.

Table 1: Preoperative patient characteristics

Descriptions	Rates (N=18)
Mean age	52 (36 – 80)
Male: female	1.25
BMI	20.1
ASA-PS	
1	6 (33.3%)
2	8 (44.4%)
3	4 (22.2%)
Comorbidities diseases	
High blood pressure	6 (33.3%)
Diabetes mellitus	4 (22.2%)
Heart disease	1 (5.6%)
COPD	1 (5.6%)
Previous abdominal surgery	4 (22.2%)
Preoperative diagnosis	
GIST	10 (55.6%)
Leiomyoma	4 (22.2%)
Early-state cancer	4 (22.2%)

The average operation time was 265 minutes (the shortest was 190 minutes and the longest was 300 minutes). The average anastomosis time was 80 minutes (shortest 60 minutes, longest 100 minutes). There were no cases of conversion to open surgery. All cases were free of cancer cells in the cut area. There were no intraoperative complications and no serious postoperative complications. There was no postoperative mortality. The mean hospital stay was 6,3 days (5 – 8 days). (Table 2)

The mean follow-up time was 20.3 months

(2 – 46 months). There was 1 case of anastomotic stenosis that occurred 8 months after surgery and was successfully dilated, one case of gastric ulcer and one case of anastomotic ulcer. All were successfully treated medically.

Based on the classification of postoperative fibrogastrosocopy, there were 3 cases of reflux 6 months later, but only one case of grade B persisted after one year. In most cases, there was no gastric stasis. Quality of life improved over time: the scores at 6, 12, and 24 months were:  $25.7 \pm 11.6$ ,  $21.3 \pm 6.2$ , and  $19.6 \pm 3.9$ , respectively. (Table 3)

Table 2. Pre-operative characteristics and early complications

Descriptions	Rates (N=18)
Operation time (min)	265 (190 – 300)
Anastomotic time (min)	80 (60 – 100)
Blood loss (ml)	100 (50 – 138)
Splenectomy	1 (5.6%)
Conversion to open surgery	0
Hospital length stays	6.3 days
Early complications	
Moderate pneumonia	1 (5.6%)
Complications of anastomosis	0 (0%)
Anastomotic leaks	0 (0%)
Anastomotic stenosis	0 (0%)
Pancreatic leak	0 (0%)
Postoperative bleeding	0 (0%)
Residual abscess	0 (0%)
Re-operated	0 (0%)
Postoperative mortality	0 (0%)

Table 3: Postoperative quality of life

Descriptions	n	6 months	n	12 months	n	24 months
Grading Los Angeles, n (%)	18		8		6	
No reflux		15 (83.3)		5 (62.5)		-
Relux level A		1 (5.6)		0 (0)		-
Relux level B		1 (5.6)		1 (12.5)		-
Relux level C		0 (0)		0 (0)		-

Relux level D	1 (5.6)	0 (0)	-
Gastric stasis n (%)	18	8	6
Level 0	12 (66.7)	5 (62.5)	-
Level 1	1 (5.6)	2 (25)	-
Level 2	2 (11.1)	1 (12.5)	-
Level 3	2 (11.1)	0 (0)	-
Level 4	0 (0)	0 (0)	-
Gastritis in remaining parts of stomach n (%)	18	8	6
Level 0	7 (38.9)	0 (0)	-
Level 1	7 (38.9)	6 (75)	-
Level 2	4 (22.2)	1 (12.5)	-
Level 3	0 (0)	0 (0)	-
Level 4	0 (0)	1 (12.5)	-
Bile fluid reflux, n (%)	18	8	6
Level 0	18 (100)	6 (75)	-
Level 1	0 (0)	2 (25)	-
GSRS scale	18	8	6
Reflux	4.7 2.8	3.2 2.0	2.8 1.4
Pain	5.4 2.8	3.8 1.5	4.0 1.4
Dyspepsia	7.9 4.4	5.7 2.4	5.9 2.1
Diarrhea	4.5 3.2	3.8 2.2	3.0 0.0
Constipation	4.4 2.4	3.7 1.7	3.1 0.3
Functioning disorder scale	13.3 7.1	9.5 3.5	9.9 3.0
General GSRS score	25.7 ± 11.6	21.3 ± 6.2	19.6 ± 3.9

*GSRS (Gastrointestinal Symptom Rating Scale)*

## Discussions

Our study shows that LPG and restoring the digestive tract using 2 flaps covering the anastomosis is feasible, safe and effective in treating early cancer or lesions submucosa (GIST, leiomyoma...) in the upper third of the stomach. There were no cases of conversion to open surgery, no complications and serious complications.

Proximal gastrectomy is effective for early gastric cancer. Compared with total gastrectomy, the survival time of proximal gastrectomy is equally long. Proximal gastrectomy is a first-line option for gastric submucosal lesions > 5 cm in the cardia [1-5,14-16].

The optimal choice of method for restoring the digestive tract after proximal gastrectomy is controversial. There are two main methods of restoring: direct esophageal-stomach anastomosis with or without an anti-reflux valve and the use of a small bowel loop. Because there is only one junction, the direct esophagogastrostomy method is simpler and less complicated. But the rate of esophageal reflux after surgery is high if no anti-reflux valve is used. In contrast, using small bowel loops such as an isolated jejunal loop or double tract is technically more complex, and postoperative complications are higher. Furthermore, the actual function of the

double tract method is still unclear [6,8,10,17].

Gastroesophageal reflux after surgery in a direct oesophageal-stomach anastomosis causes much discomfort to patients. The method of restoring the digestive tract by direct oesophageal-gastric anastomosis and with a Kamikawa-type anti-reflux valve, using 2 sphincter flaps of the stomach wall to cover and bury the anastomosis in the submucosa of the stomach given is effective in anti-reflux which is technically complex [1,17-19].

In our series, no case had to be converted to open surgery. The rate of postoperative complications was low, and the hospital length stay was short. The average follow-up time was 20,4 months with no cases of long-term complications requiring re-operation. We performed an endoscopic examination of the stomach at 6, 12 and 24 months after surgery, the rate of gastroesophageal reflux, food residue in the stomach, and gastritis of the remaining part of the stomach of this technique is low. This result is similar to other studies in the world [11,19-21].

Post-operative life quality is an important issue for patients. Using the Gastrointestinal Symptom Rating Scale (GSRS) to assess the Post-operative life quality, we found that the patient's quality of life improved over time with scores at 6, 12 and 24 months. are:  $25.7 \pm 11.6$ ,  $21.3 \pm 6.2$ , and  $19.6 \pm 3.9$ , respectively. Unpleasant symptoms such as reflux, abdominal pain, dyspepsia, diarrhea or constipation decrease over time. LPG – DFT (Kamikawa) overcame gastroesophageal reflux and significantly improved the postoperative life quality in patients with lesions in the stomach's upper third.

Although this is a new technique in treating gastric pathologies in the upper third of the stomach, this study still has limitations such as: small sample size and small number of early cancer patients, so it has not been evaluated the survival outcome in terms of oncology. Therefore, a larger sample size study is needed to compare this approach with other methods of digestive tract restoration such as isolated loop or double tract to demonstrate efficacy on quality of life and oncology.

## Conclusions

LPG –DFT of Kamikawa technique is feasible, safe in treatment of early-stage gastric cancer of the gastric cardias upper- third and submucosal lesions. The incidence of GERD is low and good quality of life and improves over time.

Conflict of interest: The authors declare that they have no conflict of interest.

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