

## Distal Subtotal Gastrectomy for Middle-third Gastric Carcinoma in Selected Patients: Short-term and Long-term Outcomes

Ramiz B Bayramov\*, Ramila T Abdullayeva and Simara E Huseynova

Department of Oncology, Azerbaijan Medical University, Baku, Azerbaijan

**\*Corresponding Author:** Ramiz B Bayramov, Department of Oncology, Azerbaijan Medical University, Baku, Azerbaijan.

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### Abstract

**Objective:** Here we describe cases of carcinoma of the middle-third of the stomach for that > 80% distal subtotal gastrectomy was carried out providing adequate proximal resection margin and jejunum was anatomized to the lesser curvature side of the stomach at the level of the esophagogastric junction just below the cardiac sphincter.

**Material and Methods:** From January 2014 till December 2020 54 patients with middle-third gastric carcinoma underwent radical intent surgery. In all of the patients excluding 5 (3 men, 2 women, mean age 62 year) was carried out total gastrectomy (with Roux-en-Y reconstruction) plus D2 lymph node dissection. In the mentioned 5 patients > 80% distal subtotal gastrectomy plus D2 lymph node dissection was carried out providing adequate proximal resection margin. In the reconstruction step of the surgery the greater curvature was invaginated with purse string suture according to the traditional technique and the gastrojejunostomy was created to the lesser curvature side of the stomach at the level of the esophagogastric junction just below the cardiac sphincter as mentioned above. The gastrointestinal continuity was reconstructed as an omega loop and in 4 patients, as a Roux-en-Y reconstruction in one.

**Results:** No postoperative complications developed. Oral nutrition started on the 3<sup>rd</sup> or 4<sup>th</sup> postoperative days and intravenous infusion discontinued on 5<sup>th</sup> or 6<sup>th</sup> days. One patient died of multiple liver metastases after 18 months following surgery without any signs of locoregional recurrence. During 3 - 62 months' control period no patient has complained of the signs of gastroesophageal reflux or dysphagia. 4 patients are alive for 3 - 62 months (mean 38 months) following surgery.

**Conclusion:** In some patients with middle-third gastric carcinoma, who refuse deprivation of the stomach totally or have higher postoperative risk for total gastrectomy, > 80% distal subtotal gastrectomy can be carried out if tumor-free proximal resection margin can be provided.

**Keywords:** Gastric Cancer; Subtotal Gastrectomy; Gastric Resection

### Introduction

Gastric carcinoma is one of the leading causes of cancer-related death worldwide, and surgery is the only curative treatment option for patients with this tumor [1,2]. The resection method includes total gastrectomy and distal subtotal gastrectomy (distal subtotal resection) for advanced stages of gastric carcinoma. The extent of gastrectomy for curative treatment depends on the loca-

tion, size, and stage of the tumor [1]. Distal subtotal gastrectomy is carried out in gastric cancer of the distal third of the stomach, total gastrectomy - in more proximal cancers. Although total gastrectomy theoretically can maximally reduce gastric remnant cancer [3], it leads to the postoperative limited diet, dysphagia, dry mouth, and reflux symptoms which will affect the patient's quality of life [4]. In distal subtotal gastrectomy, approximately 25% of the stomach

is preserved that is associated with better digestion and higher quality of life. Moreover, distal subtotal gastrectomy has advantage of quicker postoperative recovery [5]. Since Billroth performed the first distal subtotal gastrectomy in 1881 and Schlatter the first total gastrectomy in 1897, the best surgical procedure for adenocarcinoma of the distal stomach has been a subject of debate for more than a century [6]. Whether distal subtotal gastrectomy and total gastrectomy is the same in perioperative period, in terms of complications and long-term survival rate or not, different studies have different results [5].

Here we describe cases of middle-third gastric cancer for that > 80% distal subtotal gastrectomy was carried out providing adequate proximal resection margin and jejunum was anastomized to the lesser curvature side of the stomach at the level of esophagogastric junction. Choice of the surgery of such extent theoretically was encouraged by better digestion without hazarding the eradication of the tumor locally and regionally.

### Material and Methods

From January 2014 till December 2020 54 patients with middle-third gastric carcinoma underwent radical intent surgery. In all of the patients excluding 5 (3 men, 2 women, mean age 60 years) was carried out total gastrectomy (with Roux-en-Y reconstruction) plus D2 lymph node dissection. In the mentioned 5 patients > 80% distal subtotal gastrectomy plus D2 lymph node dissection was carried out providing adequate proximal resection margin the location of the tumor was distal part of the middle-third and along lesser curvature in 4 patients, along anterior wall of the stomach in one. Proximal margin was provided according to the generally accepted rules - 5 cm for exophytic tumors, 7 cm for infiltrative ones. Left gastroepiploic artery was preserved and lymphoareolar tissue around it dissected and removed. Frozen sections of the resectate were made and the proximal border was found to be tumor-free in all 5 patients. In the reconstruction step of the surgery the greater curvature was invaginated with purse string suture according to the traditional technique and the gastrojejunostomosis was created to the lesser curvature side of the stomach at the level of esophagogastric junction just below the cardiac sphincter as mentioned above (Picture 1). Gastrojejunostomosis was created to the lesser curvature unlike the traditional distal subtotal gastrectomy (Picture 2) in order not to make an obstacle to the passage of food through the cardiac sphincter by the invaginated lesser curvature angle. The gastrointestinal continuity was reconstructed as an omega loop and in 4 patients, as a Roux-en-Y reconstruction in one.

**Figure 1:** Gastrojejunostomosis created to the lesser curvature of the stomach in our patients.

**Figure 2:** Gastrojejunostomosis created to the greater curvature of the stomach in traditional distal subtotal gastrectomy.

## Results

Pathologic examination confirmed gastric adenocarcinoma invaded submucosa in 2 patients, muscularis propria in 3 patients. N status of the cancer was N0 in 2 patients, N1 - in 3 patients. No postoperative complications developed. Oral nutrition started on the 3<sup>rd</sup> or 4<sup>th</sup> postoperative day and intravenous infusion discontinued on 5<sup>th</sup> or 6<sup>th</sup> day.

One patient died of multiple liver metastases after 18 months following surgery without any signs of locoregional recurrence. During 3 - 62 months' control period no patient has complained of signs of gastroesophageal reflux or dysphagia. 4 patients are alive for 3 - 62 months (mean 38 months) following surgery.

## Discussion

Surgery is the only potentially curative method for patients with gastric cancer. The ideal surgical resection not only achieves the curative intent but also decreases postoperative morbidity and mortality. The long-term prognosis and postoperative quality of life should both be of great concern. Considering that distal subtotal gastrectomy is associated with a better quality of life and lower morbidity and mortality, many surgeons recommend distal subtotal gastrectomy as the optimal procedure for lower-third gastric cancer. However, at the moment, there is no consensus regarding the best extent of gastrectomy for middle-third gastric cancer [7].

Radical intent surgery is the only therapeutic modality promising cure for patients with gastric carcinoma. During the 140 years following the first radical intent surgery for gastric cancer performed by Billroth different variants and extents of gastrectomy has been developed and implemented. Nowadays gastrectomy with D2 lymph node dissection is the standard surgery for > T1a gastric carcinoma. The extent of the gastrectomy for curative intent depends on the location, size, and stage of the tumor [1]. Distal subtotal gastrectomy is carried out in gastric carcinoma of the distal third of the stomach, total gastrectomy - in more proximal carcinomas as mentioned above. Taking into consideration the submucosal and subserosal intramural spread of the cancer cells by lymph flow directed cranially providing of adequate proximal margin is essential for radical intent surgery. According to the general accepted rules for gastric carcinoma proximal resection margin of 5 cm for the exophytic and 7 cm for the infiltrative grow is mandatory. The same rule was followed in all our patients.

Esophagojeunoanastomosis traditionally has had high leakage rate due to fragility of uncovered with peritoneum esophageal wall.

Development and implementation of circular stapler technique decreased the leakage rate and stapled esophagojejunostomy has been recognized as the 'gold standard', with a lower leakage rate [8]. Esophagojejunal anastomosis leakage after total gastrectomy for gastric adenocarcinoma represents one of the most serious and life-threatening complications, with increased mortality rates and prolonged hospital stay after surgery [9]. Despite improvements in surgical techniques and perioperative management, esophagojejunal anastomotic leakage after total gastrectomy for gastric cancer varies from 4% to 19% [9-12]. Esophagojejunal anastomotic leakage following total gastrectomy is always associated with a high mortality rate [9,13]. Furthermore, it can result in a prolonged hospital and intensive care unit stay, which consequently leads to increased hospital costs and other negative outcomes such as the low quality of life [9,14]. Moreover prolonged recovery time due to leakage of esophagojeunoanastomosis delays start of adjuvant chemotherapy which must be reflected in the rate of disease progression and in long-term survival. Some authors have reported that occurrence of anastomotic leakage was a major independent prognostic factor for long-term survival [13,14], and the poor long-term survival rate was due to systemic inflammation, precipitated by anastomosis leakage [13]. Jo X., *et al.* (2017) retrospectively analyzed short-term and long-term results of distal subtotal gastrectomy (144 patients) and total gastrectomy (195 patients) for middle-third gastric cancer [7]. Comparative analysis demonstrated that the rate of anastomosis leakage was lower in the distal subtotal gastrectomy group than in the total gastrectomy group (0% vs 4%,  $P = 0.023$ ). Therefore, performing subtotal gastrectomy in selected patients without hazarding radicalism can be the better choice in some patients, because subtotal gastrectomy is associated with very low rate of anastomotic leakage.

Alkaline reflux esophagitis is not an infrequent complication developing after total gastrectomy mainly because of absence of the cardiac sphincter and consequent jejunoesophageal reflux. Its incidence after total gastrectomy depends on the type of reconstruction. Roux-en-Y esophagojejunostomy is the preferred method of reconstruction because it is followed by a lower rate of alkaline esophagitis as compared to simple esophagojejunostomy [15]. The incidence of alkaline reflux esophagitis is shown to be 15.2% - 45.0% in patients after total gastrectomy [15,16]. Reflux symptoms were present in approximately 25% - 50% of the patients after total gastrectomy with Roux-en-Y esophagojejunostomy [15,17]. In patients with alkaline reflux esophagitis certain complications can develop further. The most frequent are Barrett's esophagus and

stenosis of the esophagojejunostomosis. The acid reflux has been considered to be the main cause for Barrett's esophagus, but recent studies revealed that alkaline reflux could also play an important role in the development of this condition [18]. Theoretically, it develops according to the general rule that suggests that any proximal mucosa in the gastrointestinal tract has no resistance to more distal secretions and the most resistant to the given secretions epithelia replaces the unresistant normal epithelia. Patients without cardiac sphincter insufficiency can scarcely develop reflux esophagitis after distal subtotal gastrectomy and that is one of its superiority to total gastrectomy. None of our patients experienced the signs of reflux esophagitis after this extent of gastrectomy.

One of the long-term complications of total gastrectomy is narrowing of esophagojejunostomosis due to development of stricture that can require repeatedly balloon or bougie dilatation, and sometimes stenting. Stricture of esophagojejunostomosis can develop in 6.1 - 11.0% of the cases of Roux-en-Y total gastrectomy [12,19,20]. Restenosis can develop up to 10% of cases after balloon dilatation [19]. Levin M.S., *et al.* (1991) report that two (11%) of 19 patients with a Roux-en-Y esophagojejunostomy had relatively long strictures in the distal esophagus, apparently due to scarring from alkaline reflux esophagitis [12].

Theoretically and empirically digestion in patients after total gastrectomy cannot be compared with that after distal subtotal gastrectomy. Albeit mild or severe malnutrition is frequent status following the total gastrectomy after discharge and later on due to limited oral intake that is more severe than that after distal subtotal gastrectomy according to the results of some studies [21,22].

On the other hand, the other point in favor of total gastrectomy is eradication of the tumor; reduction of possible recurrence rate, prevention with higher level of probability of possible metachronous cancer foci. Total gastrectomy for distal gastric carcinoma is recommended based on the hypotheses that suggest that this greater extent of surgery decreases the probability of recurrence, eliminates the multicentric cancer loci which may remain in the gastric remnant after subtotal gastrectomy, and rules out the possibility of remnant (gastric) cancer which may develop metachronously. However, studies that investigated the superiority of these two approaches to one another report conflicting results regarding their effects on survival [5]. Nevertheless, most of the researchers discourage performing total gastrectomy for distal gastric cancer

for the concern of above-mentioned possible consequences. As mentioned above Jo X., *et al.* (2017) retrospectively analyzed short-term and long-term results after distal subtotal gastrectomy (144 patients) and total gastrectomy (195 patients) for middle-third gastric cancer and stage-stratified analysis revealed that no statistical significance existed in 5-year survival rate between the distal subtotal gastrectomy and total gastrectomy groups at the same stage. The authors concluded that distal subtotal gastrectomy for middle-third gastric cancer is superior to total gastrectomy in short-term results without sacrificing long-term survival [7]. The same results were observed by Lee JH and Kim YI (2010) after retrospective study comparatively analyzing the differences in long-term survival after total gastrectomy and distal subtotal gastrectomy for middle-third gastric cancer. The authors concluded that if the radical resection margin can be obtained for a tumor in the middle third of the stomach, distal subtotal gastrectomy should be considered instead of total gastrectomy [23]. Although the limited number of our patients undergone >80% distal subtotal gastrectomy didn't enable to compare its results with those after total gastrectomy performed for middle-third gastric carcinoma the observed long-term results seem to be encouraging.

Summarily, no one of our five patients developed any complications and all of them began full oral nutrition early like after traditional Billroth II subtotal gastrectomy. As mentioned above in long-term postoperative period no patient complained neither of the signs of gastroesophageal reflux nor dysphagia. It is notable that the suggested type of gastrectomy can only be performed in open surgery. In laparoscopic or robotic surgery creation of gastrojejunostomy to the lesser curvature side of the stomach stump at that level technically is not easy and is not required. Because in laparoscopic or robotic surgery there is no concern about postoperative dysphagia, so in those ways of surgery the lesser curvature does not need being invaginated due to that it can't become an obstacle to the passage of food.

## Conclusion

According to our opinion in some patients with middle-third gastric carcinoma, who refuse deprivation of the stomach totally or have higher postoperative risk for total gastrectomy, > 80% distal subtotal gastrectomy can be carried out if tumor-free proximal resection margin can be provided. This type of surgery can present higher quality of life compared to total gastrectomy in appropriate patients.

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