

An Analysis of Possible Risk Factors Contributing to Delayed Gastric Emptying after Distal Gastrectomy for Gastric Cancer

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Abstract

Gastric cancer is a worldwide epidemic. The standard and definitive treatment for gastric cancer is surgical resection: gastrectomy. Surgery is a common trigger for gastroparesis. DGE is arguably the most common of the post-gastrectomy syndromes, accounting for 5-20% of all cases. A clear etiology still remains unidentified. The purpose of the study is to analyze the possible risk factors contributing to development of DGE after distal gastrectomy for gastric cancer.

A retrospective study of 252 patients, who underwent distal gastrectomy for gastric cancer, was conducted from January 2010 to December 2015. 18 patients developed DGE with an occurrence rate of 7.1%. The incidence of DGE was found to be significantly higher in patients with 1) Gastric outlet obstruction (P=0.031), 2) Roux-en-Y reconstruction surgery (P=0.041), 3) Side to end gastrojejunostomy (P=0.03), 4) Tumor in the lower 1/3rd (P= 0.027) and 5) Ulcerative lesion (P=0.001). DGE continues to affect a considerable number of patients after gastric surgery. Proper preoperative preparation and postoperative management can considerably reduce the incidence of DGE.

Keywords: Gastrectomy; Gastroparesis; DGE; Roux-en-Y

Gastric cancer is a worldwide epidemic. A surgical resection: gastrectomy is the only available standard and definitive treatment [1,2] With recent developments, early diagnosis of the disease has led to a substantial improvement in the survival rate and quality of life.

Prolonged gastric stasis after gastrectomy is not a normal event. Following an uncomplicated surgery, while major

- 1) Patients unable to tolerate oral intakes after 10th postoperative days
- 2) Nasogastric drainage >800 ml/day lasting for more than 10 postoperative days
- 3) No evidence of obvious obstruction.

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- 1) Patients who underwent distal gastrectomy for gastric cancer;
- 2) Any operative and reconstruction method;
- 3) Cases without mechanical obstruction;

Among the 252 patients who underwent distal gastrectomy, 18 patients (7.14%) were diagnosed with DGE. Clinico-pathologic feature such as age, gender, blood type, comorbidity (such as diabetes mellitus, hypertension, cardiac or cerebrovascular ischemic disease), operative conditions, tumor site, TNM stage, anastomosis type, reconstruction method, resection extent were reviewed. DGE was diagnosis as per the above criteria and confirmed by upper gastroenterography with 30% meglumine diatrizoate.

In Zhong Da Hospital, patients undergo standardized treatment. Gastrectomy with D2 lymphadenectomy is performed, following proper preoperative preparations. Under general anesthesia, patients undergo distal gastrectomy followed by gastrojejunostomy. Linear and circular surgical staplers are used for intestinal resection and anastomosis. A drainage tube is placed as long as required. A Ryle's nasogastric tube and a nasojejunal feeding tube are inserted intraoperatively. Postoperative management includes IV fluids, enteral nutrition, proton pump inhibitors, analgesics, albumin and electrolyte supplements and other supportive medications as required. Nasogastric drainage is continued as long as required. On the 8th postoperative day, oral liquids is initiated and continued as tolerated by the patient.

SPSS v.20 was used for statistical analysis. Clinical characteristics of patients were summarized as whole as well as described specifically for subgroups by descriptive studies. All values are expressed as their mean ± standard deviation (SD) (Table 1). After descriptive studies, either a t-test or chi square test was used to compare variables between groups. Multiple logistic regression was used to analyze the risk factors for DGE (Table 2).

Variables	NON-DGE (N=234)	DGE (N=18)	P-value
Age	62.19 ± 12.425	65 (median)	0.499
Gender			
Male	162	15	0.207
Female	72	3	
Comorbidity	94	9	0.549
DM*	34	2	0.805

HTN*	84	8	0.468
Ischemia*	34	3	0.805
Prev. Surgery	38	2	0.566
GI bleeding	38	3	0.962
GOO*	25	5	0.031
Surgical setting			
Elective	173	11	0.238
Emergency	61	7	
Surgery			
BILLROTH-I	74	1	0.041(R)
BILLROTH-II	74	6	
ROUX-EN-Y	86	11	
Resection			
Partial	23	0	0.243
Hemi	27	1	

Subtotal rate of the ilaced as lost. 34BILLROTH-I

KResec)BILLROTH-22IsEr38aBILLROTH-I-BILLROTH-obe8

5 0.031

DGE is a chronic heterogeneous disorder of gastric motility and is defined as delayed emptying of a solid meal in the absence of mechanical obstruction [5,6,22]. It is a complex disorder characterized by postprandial nausea, vomiting and gastric atony without evidence of mechanical gastric outlet obstruction [7,13].

In our study, the incidence of DGE was found to be 7.14%, which no less than 5-20% as described by other investigators [3,4]. With regard to the delayed return period, different authors have defined DGE with different postoperative days [3,4,10,11]. Bar-Natan defined DGE as the inability to eat a regular diet after 7-10 postoperative days [4] while Cohen et al. [3] and Meng et al. [11] defined DGE as the inability to tolerate oral intakes after 10 postoperative days. For this study, we have chosen 10 postoperative days.

The incidence of DGE was slightly higher in male patients than female and in patients with age >60 years and with a co-morbid condition, but the variables were found not to be statistically significant. On the other hand, patients with preoperative gastric outlet obstruction has significantly higher rate of DGE. The finding is consistent with other previous reports [4,11]. Hermann and Johnson stated a 2.5 times increase of DGE in patients with gastric outlet obstruction [23].

Preoperative albumin status, electrolyte imbalance, decreased hemoglobin level and also postoperative albumin status were found to be statistically insignificant variables. This finding is similar to previous reports [10,11]. Theoretically, this may be attributed to proper preoperative conditioning and postoperative management. Enteral feeding, adequate fluid infusion with electrolyte supplements and albumin transfusions postoperatively could potentially eliminate malnutrition as a causative factor for DGE.

Surgical setting (elective or emergency), surgical resection, operative time and blood loss, history of previous abdominal surgery were found to be statistically insignificant. Previous studies however show operative time and previous abdominal surgery to have effect on the incidence of DGE. Previous abdominal surgery can cause serious intraperitoneal adhesions and prolong operative time. The development of surgical instrument such as staplers for anastomosis and resection, electrical cauterization devices have significantly reduced the operative time and made it less troublesome for surgeons.

The ideal gastrointestinal reconstruction procedure should diminish postoperative morbidity and improve quality of life. Although Roux-en-Y has been associated with significant reduction in the complications rate [2] and DGE as well, our study finds it as a significant risk factor. This finding does conflict with some previous investigations [2,11]. Dong et al. and Kung et al. [10] did cite Roux-en-Y reconstruction as a risk factor [13]. Hirao M et al. also found a strong association between DGE and Roux-en-Y reconstruction [24]. The Roux-en-Y is however, the ideal choice of reconstruction after total gastrectomy [2]. Completion or subtotal gastrectomy with Roux-en-Y gastrojejunostomy has been recommended for treatment of persisting or unresolved DGE [5, 6, 25].

Furthermore, a side to end gastrojejunostomy emerged as a risk factor for DGE. The exact etiology is not clear and a further evaluation is in progress. A hypothesis states that the formation of rugae of mucosal and sub-mucosal folds associated with the use of staplers for anastomosis does create a somehow significant luminal narrowing and

disruption in normal mucosal and sub-mucosal continuity resulting in motility dysfunction.

With regards to tumor factors, no significant relation was found with tumor staging and differentiation. Total gastrectomy was preferred with majority of the cases with low differentiation. Tumors in the lower 1/3rd of the stomach and presence of ulcerative lesion were however, found significant to incidence of DGE.

Apart from DGE, other surgical complications were also observed in the patients (7/252) such as afferent loop syndrome, anastomosis leakage and stricture, bleeding etc. but a further analysis was not done.

DGE is still a frequent complication of gastric cancer surgery and is further psychological and financial burden for patients. In majority of the cases, DGE spontaneously resolves within 6 weeks and reoperation is seldom required thus, the eagerness for reoperation should be avoided. The resolution of symptoms may also be accompanied by improvement in gastric emptying suggesting that either the enteric nervous system may be able to adapt the loss of vagal input or that vagal innervation or regeneration of nerve fiber may occur.

The study revealed several risk factors for DGE including Roux-en-Y reconstruction, gastric outlet obstruction, tumor of the lower 1/3rd stomach, side to end gastrojejunostomy and presence of ulcerative lesion. Proper preoperative preparation and postoperative management can considerably reduce the incidence of DGE.

This report does have some limitations and hence, the results should be interpreted with a degree of caution. The study has a relatively small sample size. Although DGE is normally not a very serious complication, it is better to avoid it.

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