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Post-operative morbidity in patients undergoing surgery for proximal gastric cancer: A comprehensive assessment

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Abstract

Introduction: Proximal gastric cancer, particularly esophagogastric junction cancer, poses a complex therapeutic challenge marked by high morbidity, mortality, and a generally bleak prognosis. This study is aimed to assess post-operative morbidity in patients undergoing surgery for proximal gastric cancer.

Materials and Methods: This prospective observational study was conducted at the National Institute of Cancer Research and Hospital Department of Surgical Oncology. Patient selection followed pre-defined inclusion and exclusion criteria, leading to a study cohort of 50 eligible individuals. Data collection utilized a structured case record form, and the post-operative outcome was evaluated by examining complications and measuring hemoglobin and serum albumin levels. Statistical analysis employed the Statistical Package for Social Science (SPSS-24), incorporating the Paired Student's t-test and Z proportion test where applicable.

Results: In this study, a notable 52% of subjects experienced no complications. Throughout the study period, complications included wound infection (14%), wound disruption (4%), anastomotic leakage (4%), pneumonia (6%), peritonitis (4%), and duodenal stump leakage (6%). In addition, anastomotic stenosis (8%) and dumping syndrome (14%) were observed.

Conclusion: Total radical gastrectomy featuring Roux-en-Y esophagojejunostomy for proximal gastric cancer showed good short-term outcomes with a few complications. The most common post-operative complications surgery-related were wound infections and anastomosis leakage.

Keywords: Morbidity, proximal gastric cancer, total radical gastrectomy, wound infection.

Introduction

Stomach cancer accounted for 769,000 deaths worldwide in 2020.[1] Despite the decline in gastric cancer overall, there has been a dramatic increase in the incidence of cancer of the gastric cardia.[2] The incidence of gastric cancer involving the upper part of the stomach is high in Western countries. In Asia, gastric cancer in the lower part of the stomach is common, but an increasing incidence

of proximal gastric cancer has been observed in recent years.[3] According to the latest WHO data published in 2020, Stomach Cancer Deaths in Bangladesh reached 6,799 or 0.95% of total deaths. Using esophagogastroduodenoscopy[4] raised the detection rate of gastric cancer at an early stage. Surgical resection is the gold standard and offers the only potential for cure. A total gastrectomy with Roux-en-Y (RY).[5] Esophagojejunostomy (EJS) is a surgical procedure that involves removing the entire stomach and omentum and then reconnecting the esophagus to the small bowel. The process is used to treat gastric cancer in the upper or entire stomach worldwide, especially after the introduction of suturing instruments, such as linear or circular staplers, with variable short-term post-operative outcomes. These complications may be sub-categorized as "local and systemic." The local complications are – wound infection, anastomotic leakage, duodenal stump leak, infra-abdominal abscess, and peritonitis. The systemic complications are aspiration pneumonia, cardiac arrest, urinary tract infection, pulmonary embolism, and thrombosis.[6] Various factors are responsible for the post-operative complications following esophagogastric cancer surgery. The factors can be categorized into three subclasses: patient and surgeon, and disease factor. The patient's factors are highly significant compared to the surgeon's. The patient's factor is their general conditions, food habits (smoking), and nutritional status. The disease factors are the staging of the disease, the spread of the disease, and tumor biological behavior. On the contrary, skill, expertise, and appropriate logistic support are critical surgeon factors that can influence the post-operative outcome of such a surgery. Understanding the short-term outcomes is essential for clinicians to assess the initial impact of total radical gastrectomy on patients with proximal gastric cancer. This information is crucial for making informed decisions regarding patient care and management during the early stages of recovery. This study is aimed to assess post-operative morbidity in patients undergoing surgery for proximal gastric cancer.

Materials and Methods

This prospective observational study was conducted in the Department of Surgical Oncology, National Institute of Cancer Research and Hospital, Mohakhali, Dhaka, from January 2018 to August 2019. Patients with proximal gastric cancer admitted to NICRH for operative treatment were considered as the study population. A total of 100 patients were selected as study subjects by purposive sampling technique. The eligibility criteria of the study subjects included histologically proven adenocarcinoma, no distant metastasis, and a potentially resectable mass (R0) with lymph node (LN) dissection. A total radical gastrectomy with RY EJS was performed. All the documents, such as pre-operative investigations, measures taken to optimize the patient's fitness for an anesthetic checkup, per-operative events, and post-operative outcomes were categorically taken in a pre-fixed, peer-reviewed, interviewed, and observation-based data collection sheet. Post-operative adjuvant chemotherapy with platinum and fluorouracil was principally administered. Overall survival was defined as the period from the initiation of surgery to any cause of death and recurrence-free survival as the period from the initiation of surgery to recurrence or death. All patients were outpatient followed up every 3–6 months. Physical examination and hematologic analysis were performed at each visit, including tumor marker evaluation for carcinoembryonic antigen, carbohydrate antigen 72-4, and carbohydrate antigen 19-9. All the data were compiled and appropriately sorted, and the quantitative data were analyzed statistically using Statistical Package for Social Science (SPSS-24). The results were expressed as frequency, percentage, and mean ± SD, and $p<0.05$ were considered the significance level – comparisons of continuous variables between the two groups with paired sample t-tests. In addition, comparisons of proportions between the two groups were made with Z proportion tests. A logistic regression model was used to predict the probability of a binary outcome based on one or more predictor variables. Ethical clearance was obtained from the Institutional Review Board

(IRB) of the National Institute of Cancer Research and Hospital, Mohakhali, Dhaka.

Inclusion criteria

- Diagnosis of gastric adenocarcinoma confirmed by tissue biopsy.
- Age between 20 and 80 years.
- Willingness to participate, confirmed by signing a written informed consent.
- Eligibility for proximal gastrectomy based on pre-operative tests, including:
  - The tumor is located in the proximal third of the stomach.
  - Tumor size ≤5 cm.
  - Clinically staged as T1 (tumor).
  - All LNs ≤8 mm on pre-operative imaging, with specific attention to LNs 4d, 5, 6, and 10.
- Eligibility for radical resection or curative intent surgical resection.

Exclusion criteria

- Prior chemotherapy or radiotherapy for gastric cancer
- Need for combined resection due to other conditions (except for cholecystectomy)
- Presence of concurrent malignancies that could impact gastric function preservation, including a history of or current malignancy in other organs
- History of or ongoing treatment for systemic inflammatory disease
- History of previous gastrectomy
- Vulnerable populations, including pregnant women, women planning pregnancy, or individuals lacking decision-making capacity.

Results

Most of the participants fall within the 50–60 age range (44%), followed by the 40–50 age group (24%). In terms of gender, the population is predominantly male (64%). Body Mass Index (BMI) analysis indicates that nearly half of the participants have a BMI between 18.5 and 24.9 (48%), while 70% of the population are smokers. The socioeconomic breakdown shows a majority in the middle class (60%). Tumor size distribution indicates that 48% of cases fall within the 2.5–4 cm range. Notably, 87% of the population does not exhibit metastasis. Most index surgeries are completed in 2–3 h (60%). Regarding treatment plans, 52% undergo neo-adjuvant therapy, and 92% receive adjuvant treatment. This table serves as a comprehensive overview, offering valuable insights into the demographic and health-related characteristics of the study cohort [Table 1].

In this study, the majority (40%) of study subjects were in the T2 stage according to the T stage. According to the N stage, the majority (56%) of the subjects were in the N2 stage [Figure 1].

The most common post-operative complications surgery-related were wound infections and anastomosis leakage. However biochemical-related complications were post-operative low hemoglobin and low serum albumin levels at 2 weeks. About 50% of the participants' Hemoglobin albumin decreased at 2 weeks following operation [Table 2].

Discussion

The majority of participants in the study are aged 50–60 years (44%), with a significant proportion also falling into the 40–50 age group (24%) in this study. This age distribution aligns with findings from previous research, which indicates that gastric cancer incidence increases with age, particularly in individuals over 50.[7] The post-operative leak can arise from any of the suture or staple lines, including the jejuno-jejunal anastomosis of a RY.[2] An anastomotic leak typically occurs within the first 7–10 days following surgery. Patients may exhibit symptoms including fever, unexplained tachycardia and/or hypotension, abdominal pain, and/or an acute abdomen. If an anastomotic leak is suspected, a computed tomography (CT) scan should be performed. The CT may reveal indirect signs of a leak, such as pneumoperitoneum, extraluminal contrast, inflammatory stranding,

Table 1: General characteristics of study population (*n*=100)

Parameter	Categories	Percentage
Age	40–50	24.0
	50–60	44.0
	60–70	22.0
	70–80	10.0
Sex	Male	64.0
	Female	36.0
BMI (kg/m^2)	18.5–24.9	48.0
	25–30	44.0
	>30	8.0
Smoker	Yes	70.0
	No	30.0
Betel nut taker	Yes	6.0
	No	94.0
Alcoholic	Yes	24.0
	No	76.0
Socioeconomic conditions	Upper class	4.0
	Middle class	60.0
	Lower class	36.0
Tumor size (cm)	2.5–4	48.0
	4.1–6	32.0
	6.1–9.2	20.0
Time of index surgery	2–3 h	60.0
	3–4 h	40.0
Treatment plan (Neo-adjuvant)	Yes	52.0
	No	48.0
Adjuvant	Yes	92.0
	No	8.0

Table 2: Post-operative complications (*n*=100)

Parameter	Categories	Percentage
Complications	Wound infection	28
	Wound disruption	12
	a. Anastomotic leakage	12
	b. Esophagojejunostomy site	8
	c. Jejunojejunostomy site	4
	Duodenal stump leakage	4
	Peritonitis	8
	Pneumonia	12
	Deep vein thrombosis	4
Hemoglobin (g/dL)	Low	48
	Normal	52
Serum albumin (g/dL)	Low	46
	Normal	54

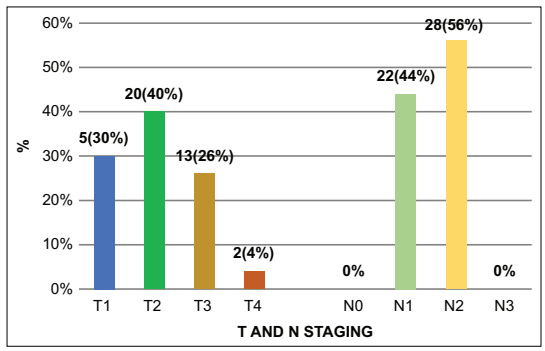

Figure 1: Distribution of study subjects according to T and N staging (*n*=50)

fluid collections, and/or abscesses. For direct visualization of the leak, contrast studies, such as an upper gastrointestinal series with Gastrografin can be used. The present study evaluated the complications of surgery for gastric carcinoma. 100 cases of primary gastric carcinoma that meet the inclusion criteria were selected. After assessing the logistic regression, we found that our significant complications are wound infection, anastomotic leakage, EJS site, and jejunojejunostomy site. Our insignificant complications are Duodenal stump leakage, Peritonitis, Pneumonia, and Deep vein thrombosis. We calculated odds ratios for the significant one. In the present study, smoking, taking betel leaves and nuts, and drinking alcohol were their habits. This finding agreed with the study of Shi *et al*.[8] In the present study, most study subjects were in T2 and N2 stages according to the T and N stages. This finding was in agreement with a previous study.[9] However, Nusrath *et al*.[10] disagreed with our studies. This may be due to different methodologies. The time of index surgery was 2-3 hours in most subjects. Huang *et al*.[11] found that the mean operation time

was 267 ± 88 min. Hong *et al*.[9] reported that open radical gastrectomy needs less operation time than laparoscopy-assisted radical gastrectomy. Before total radical gastrectomy with RY EJS, 52% of patients received neo-adjuvant chemotherapy, and 92% of patients received adjuvant chemotherapy after total radical gastrectomy with RY EJS. Nusrath *et al*.[10] also advised adjuvant chemotherapy after total radical gastrectomy. Chen *et al*.[12] reported that 51.1% of patients received adjuvant chemotherapy after total radical with RY EJS. During the operation, strict asepsis was followed in every step, and broad-spectrum intravenous antibiotic was given for 3 days. Initial recovery was uneventful in the cases. However, during the study, only a few subjects developed wound infection, wound disruption, anastomotic leakage, pneumonia, deep vein thrombosis, peritonitis, duodenal stump leakage, anastomotic stenosis, and dumping syndrome. This finding was in agreement with Hong *et al*.,[9] and Shi *et al*.,[8].

Limitations of the study

The study was conducted in a single hospital with a small sample size. Hence, the results may not represent the whole community.

Conclusion

Total radical gastrectomy featuring RY EJS for proximal gastric cancer showed good short-term outcomes with a few complications. The most common post-operative complications surgery-related were wound infections and anastomosis leakage.

Recommendation

To improve outcomes after total radical gastrectomy with RY EJS for proximal gastric cancer, focus on pre-operative optimization by addressing nutritional deficiencies and risk factors. Implement stringent infection control practices to prevent wound infections and use meticulous techniques to reduce anastomotic leakage. Enhance post-operative monitoring to quickly identify and manage complications, and educate patients on care and signs of issues to ensure timely intervention.

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Conflicts of Interest

None declared.

References

1. Sung H, Ferlay J, Siegel RL, Laversanne M, Soerjomataram I, Jemal A, *et al*. Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA Cancer J Clin 2021;71:209-49.
2. Thrift AP, Wenker TN, El-Serag HB. Global burden of gastric cancer: Epidemiological trends, risk factors, screening and prevention. Nat Rev Clin Oncol 2023;20:338-49.
3. Ahn HS, Lee HJ, Yoo MW, Jeong SH, Park DJ, Kim HH, *et al*. Changes in clinicopathological features and survival after gastrectomy for gastric cancer over 20 years. Br J Surg 2011;98:255-60.
4. Vanlalhlua C, Lalramlawmi R. Role of esophagogastroduodenoscopy for detection of upper GI malignancy-our experience. Ann Int Med Den Res 2020;6:SG05-8.
5. Besson A. The Roux-Y loop in modern digestive tract surgery. Am J Surg 1985;149:656-64.
6. Kodera Y, Fujiwara M, Ohashi N, Nakayama G, Koike M, Morita S, *et al*. Laparoscopic surgery for gastric cancer: A collective review with meta-analysis of randomized trials. J Am Coll Surg 2010;211:677-86.
7. Yoo CH, Sohn BH, Han WK, Pae WK. Long-term results of proximal and total gastrectomy for adenocarcinoma of the upper third of the stomach. Cancer Res Treat 2004;36:50-5.
8. Shi Y, Li L, Xiao H, Guo S, Wang G, Tao K, *et al*. Feasibility of laparoscopic gastrectomy for patients with Siewert-type II/III adenocarcinoma of the esophagogastric junction: A propensity score matching analysis. PLoS One 2018;13:e0203125.
9. Hong L, Han Y, Jin Y, Zhang H, Zhao Q. The short-term outcome in esophagogastric junctional adenocarcinoma patients receiving total gastrectomy: Laparoscopic versus open gastrectomy-a retrospective cohort study.

Int J Surg 2013;11:957-61.

10. Nusrath S, Thammineedi SR, Raju VN, Patnaik SC, Pawar S, Santa A, *et al*. Short-term outcomes in patients with carcinoma of the esophagus and gastroesophageal junction receiving neoadjuvant chemotherapy or chemoradiation before surgery. A prospective study. Rambam Maimonides Med J 2019;10:e0002.
11. Huang CJ, Zhang RC, Mou YP, Zhou YC, Wang YY, Lu C, *et al*. Short and long-term outcomes of laparoscopic total gastrectomy for gastric cancer: A single-center experience (retrospective cohort study). Int J Surg 2018;51:109-13.
12. Chen XZ, Wang SY, Wang YS, Jiang ZH, Zhang WH, Liu K, *et al*. Comparisons of short-term and survival outcomes of laparoscopy-assisted versus open total gastrectomy for gastric cancer patients. Oncotarget 2017;8:52366.