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ORIGINAL ARTICLE

Assessment of Laparoscopic Gastrectomy in Treatment of Early Gastric Cancer

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ABSTRACT

Background: Gastric cancer is the third most common type of cancer worldwide. Gastric cancer has a 15% to 20% 5-year overall survival rate, even if the disease just affects the stomach wall. The prognosis is favorable if tumors and their precursors are discovered early on.The current study intended to enhance the prognosis of patients suffering from early-stage stomach cancer.

Methods: In this study, 24 patients with stomach cancer who attended to Zagazig University Hospitals' outpatient clinic were included. Every patient underwent a complete medical history, a general examination, and an abdominal examination that included PR and PV. Laboratory tests were performed. Along with gastroscopy and biopsies, all patients also underwent CT, ultrasonography, and CXR scans.

Results: There were six women and eighteen men in the study. The distal portion of the stomach was the site of malignancy in all 100 cancer patients under study. A statistically significant correlation was not observed between the sex of the cancer cases under study and either the age distribution or the tumor site.

Conclusions: Laparoscopic distal gastrectomy is a safe and effective treatment that offers advantages over open conventional gastrectomy for treating stomach cancer. These advantages include a lower risk of intraoperative blood loss and overall consequences.

Keywords:**Laparoscopic Gastrectomy; Early Gastric Cancer; Treatment**

INTRODUCTION

The third most common cause of cancer-related deaths worldwide is still stomach cancer. East Asian nations with elevated cancer incidence rates have recently instituted targeted screening programmes to identify stomach cancer at an early stage and actively monitor concerning lesions using endoscopy**[1]**.

Early diagnosis rates have led to the development of minimally invasive therapy techniques, which are currently commonly employed. These methods include endoscopic removal of early tumors with a very low risk of lymph node metastasis and laparoscopic surgery for stage I illness. After being diagnosed, only a small proportion of patients in Western countries achieve these standards**[2]**.

The majority remain to exhibit symptoms at an advanced stage of the disease, for which surgical resection plus a sufficient D2 lymphadenectomy remains the recommended course of treatment, usually with perioperative chemotherapy. However, despite many advances, only around 30% of patients in the population achieve a 5-year survival [1,2].

Early gastric cancer (EGC) is defined as any invasive gastric adenocarcinoma, regardless of tumor size, that invades no deeper than the submucosa. This may manifest with or without metastases from lymph nodes[3].

Different histologic, anatomical, and genetic patterns of gastric cancer might occur, which affects the surgical approach and necessitates a multimodality treatment plan specific to each patient. Patients with stomach cancer

who receive a gastrorectomy with the intention of curing their disease are still not eligible for any further treatment[4].

The primary mode of treatment for potentially curable gastric cancer is thought to be a gastrectomy combined with a suitable lymphadenectomy[5].Open resection was the method used for many years in stomach surgery; however laparoscopic distal gastrectomy has gained popularity recently. In Asian nations, this is particularly noticeable[6].

Laparoscopic gastrectomy has become the usual treatment for early-stage stomach cancer in Korea and Japan due to advancements in laparoscopic technology. According to the current information, the oncological result of a laparoscopic partial gastrectomy is comparable to that of an open resection[5,6].

Compared to open surgery, laparoscopic surgery is generally associated with less discomfort, a quicker recovery of gastrointestinal function, improved pulmonary function, a lower stress reaction, a shorter hospital stay, and a higher quality of life after surgery[7].

Complete laparoscopic gastrectomy (TLG) is a technically complex procedure, hence the literature sadly contains very little information about it. This problem is associated with the dissection of lymph nodes, particularly those surrounding the splenic hilum, and the development of the oesophago-jejunal anastomosis[6].

Consequently, the purpose of this study was to assess the viability, surgical results, and oncological impact of laparoscopic gastrectomy in the management of early-stage stomach cancer. To evaluate the benefits and limitations of laparoscopic therapy of stomach cancer.

METHODS

Patients with stomach cancer who visited Zagazig University Hospitals' outpatient clinic were the subjects of this study. Between August 2021 and August 2023, the study was prospectively carried out, and every procedure was done voluntarily.

Inclusion criteria involved the patient was found to have both T1a and T1b adenocarcinomas, early stages of stomach cancer. After receiving neoadjuvant chemotherapy, the patient was diagnosed with stage 2 stomach cancer. The patient has cancer in the antrum and pylorus portions of their distal stomach. The patient gave permission for the surgery to be performed.

Exclusion criteria involved the patient exhibits a T3 gastric cancer and a T4 adenocarcinoma. patient who has metastasized distantly. Patient is not suitable for surgery. cases of emergency, such as perforated tumours, admitted to the emergency unit. reasons not to have laparoscopic surgery. patient who underwent upper abdominal surgery previously. Individual suffering from proximal gastric cancer (body, fundus, and heart). The procedure is refused by the patient.

Operational Design;

A complete history, a general examination, and an abdominal examination with PR and PV were performed on every patient.Standard laboratory tests include the complete blood count (CBC), the prothrombin time and concentration, the INR, kidney function tests, liver function tests (SGOT, SGPT, and albumin), and random blood glucose testing.Special Laboratory investigations: as Serum CEA.Imaging tests, such as pelvic and abdominal CT scans with IV and oral contrast, chest x-rays, and pelvic CT scans.

Preoperative Preparation:Intraoperative intravenous antibiotic: Intravenous metronidazole infusion administered within one hour before to surgery, along with third-generation cephalosporin (Cefotaxime 1 gm) as a routine intraoperative antibiotic.

Prophylactic treatment for DVT: Each patient was given an equivalent weight-based dose of low molecular weight heparin (Enoxaparin). within 12 hours of the procedure, at a rate of 0.5 mg per KG, and all patients were required to wear graded compression, or elastic, stockings (GCS).

Operative Technique of Laparoscopic D2 distal gastrectomy:

General anaesthesia was administered to each patient. For every patient, a Foley's catheter and nasogastric tube were placed.

The patient was positioned in both the reverse Trendelenburg and supine postures. An antiseptic solution was used to prepare the abdomen, which was then regularly wrapped. 10 mm infraumbilical incision, Veress needle insertion, and carbon dioxide insufflation of the abdominal cavity. Following insufflation, the camera was placed within the belly and the liver, small bowel, and peritoneal surfaces were thoroughly examined.

For early gastric cancer, a partial omentectomy is a safe procedure that involves severing the gastrocolic ligament more than 3 cm from the vascular arcade of the greater curvature side of the stomach.

After cutting the right gastro-epiploic vein flush with the stomach's trunk, the helper retracts the stomach anteriorly and continues the dissection around the pylorus. The pancreas and mesocolon are dissected along the avascular plane until the second section of the duodenum is reached. By locating the anterosuperiorpancreatico-duodenal vein and excising all soft tissue proximally to the vein, lymph node station 6 was completely dissected. The right gastroepiploic artery is severed and clipped where it divides from the gastrodoudenal artery, just before the pancreatic head. The pylorus is subsequently released, the pyloric arteries are sectioned, and the lymph node basins of the infrapyloric tiers are resected collectively. The duodenum and gastroduodenal artery are separated further, leading to the right gastric artery's root. To facilitate identification, the dissection of the lymph nodes around the hepatic artery should be carried out as thoroughly as possible around the right gastric artery.

- Suprapyloric Dissection: Because the right gastric artery and its small suprapyloric branches bleed readily, they are carefully dissected with an ultrasonic instrument. Following the excision of the upper duodenum's smaller omentum, the hepatic artery was used to identify and ligate the right gastric arteries at their root. The duodenum was then cut with a laparoscopic linear stapler 1-2 cm distal to the pyloric ring. This was typically accomplished using a green cartridge (4.1 mm staple load) and a 60 mm end GIA laparoscopic linear stapler.

- The dissection of the lymph nodes in the supra-pancreatic region begins in the central area surrounding the left gastric artery and proceeds left and right, terminating at the splenic and common hepatic arteries. Among those engaged in lymphadenectomy in this area are stations 7 (left gastric a.), 8 (common hepatic a.), 9 (celiac axis) for a D1+ dissection, 11 (proximal splenic a.), and 12 (proper hepatic a.) for D2 dissection. After cleaning the base of the left stomach artery and ligating it with two clips, the left gastric vein is found and clipped shut. Further dissection separates lymph node station 1 (righparacardial) and releases the posterior wall of the cardia.The stomach is extracted proximally, with the locations of the tumour guiding the selection of the stomach's sites. Multiple 45- or 60-mm endoscopic linear staplers with blue cartridges (3.5 mm staple load) are used for the transaction.

- The gastro-jejunal anastomosis: a gastrotomy was done on the posterior wall at the corner of the staple line's greater curve. Ten to fifteen centimetres from the end of the jejunum's alimentary loop, an entrotomy was performed. The 60-mm linear stapler's cartridge fork was placed into the jejunum's enterotomy, and the other fork was then placed into the stomach via a gastrostomy created on the gastric stump's larger curve corner. The stapler was fired, creating a gastrojejunostomy from side to side. Bipolar coagulation was used to stop any bleeding that occurred from the anastomosis, which was checked from the lumen. The anastmosis was used to pass the nasogastric tube all the way to the jujenum. A second linear stapler

fire was used to seal the residual enterotomy.

- Specimen extraction and placement of drains: A Pfannenstiel incision of 5 cm is subsequently performed. After then, the specimen is externalised. Following the closure of this incision, hemostasis was carried out, the pneumoperitoneum was rebuilt, and two drains were inserted: one at the gastro-jejunalanastmosis and the other at the pelvis.

Post-operative outcomes: Including ICU admission; time of return of bowel function; time until resumption of full oral intake; length of hospital stay, complications and mortality.

Assessment of oncological outcome by:Provide specific pathological information, such as the number of lymph nodes removed, safety margins, tumour size, histology, and differentiation grade. Follow-up data for six months was recorded regarding port site, distant metastases, and recurrence.

Statistical analysis

Data collected throughout history, basic clinical examination, laboratory investigations and outcome measures were coded, entered, analyzed using Microsoft Excel software. Data had then been imported into Statistical Package for the Social Sciences (SPSS version 20.0)software for analysis. According to the type of data qualitative represent as number, percentage, quantitative continues group represent by mean± SD, the following tests had been used Chi square test(X^2). P value had set at > 0.05 for non-significant results,<0.05 for significant results.

RESULTS

The study included 24 patients (18 males and 6 females). Males represented the majority of the study group (75%) and their ages ranged from 38 to 67 years old, with a mean age of 55.87 ± 7.37 years. Among them, two thirds (66.7%) were between the ages of 50 and 60. Diabetes affected almost 1/4 of the cancer patients under study. Among the examined cancer cases, there was no statistically significant relationship between sex and the age distribution or tumour site (p>0.05)(Table 1).

Blood loss ranged from 150 to 310 ml, with a mean of 238 ± 40.08 ml. The surgery duration ranged from 180 to 280 minutes. The mean operation time was 251.87 ± 24.14 minutes(Table 2).

Among the cancer cases under study, there was no statistically significant correlation found between the number of lymph nodes and the histopathology of stomach cancer (Table 3).

The duration of hospital admissions varied from 4 to 20 days, with an average of 6.53 ± 3.7 days. The onset of oral feeding was initiated between 2 and 5 days, with an average of 3.53 ± 0.74 days (Table 4).

After surgery, 75% of cases required an intensive care unit (ICU); only 4.2% of cases had a post-operative embolism; all cancer patients who underwent surgery recovered(Table 5).

There was no statistically significant relation between sex and occurrence of post-operative complications among the studied cancer cases (p>0.05) (Table 6).

There is statistically significant relation between type of operation and site of tumor among the studied cancer cases (p<0.05) (Table 7).

Table (1): Relation between Sex distribution and site of tumor among the studied cancer cases.

Variables	Sex				X^2	p- value
	Male *(n=18)*		Female *(n=6)*			
	No.	%	No.	%		
Age groups						
Less than 40	0	0.0	1	16.6	5.000	0.172 (NS)
40	1	5.6	0	0.0		
50-	12	66.7	4	66.7		
≥60	5	27.7	1	16.6		
Diabetes mellitus						
Absent	13	72.2	4	66.7	0.085	0.770 (NS)
Present	5	27.8	2	33.3		
Site of tumor						
Proximal	0	0.0	0	0	5.15	0.076 (NS)
Midbody	2	11.11	1	16.6		
Distal	16	88.89	5	83.4		

X^2:chi-squaretest , NS:non-significant

Table (2): Operation time and amount of blood loss among the studied stomach cancer cases.

Item	Studied cases*(n=24)*
Operation time(min)	
Mean ± SD	251.87 ± 24.14
Median (Range)	256 (180 - 280)
Amount of blood loss (ml)	
Mean ± SD	238 ± 40.08
Median (Range)	235 (150 - 310)

Table (3): Relation between Histopathology of stomach cancer and number of lymph nodes among the studied cancer cases.

Number of lymph nodes	Histopathology of stomach cancer				p- value *
	Adeno-carcinoma *(n=17)*	Mucinous adeno carcinoma *(n=5)*	Sigent ring adeno carcinoma *(n=1)*	GIST *(n=1)*	
Mean ± SD	15.89 ± 1.61	14 ± 0.82	15 ± 0	8 ± 0	0.083 (NS)
Median (Range)	16 (14-19)	14 (13-15)	15	8	

** Kruskalwallistest NS:non-significant*

Table (4): Length of hospital stays post-operative among the studied stomach cancer cases.

Item	Studied cases *(n=24)*
Length of hospital stays *(days)*	
Mean ± SD	6.53 ± 3.7
Median (Range)	6 (4 - 20)
Time of start oral feeding *(days)*	
Mean ± SD	3.53 ± 0.74
Median (Range)	4 (2 - 5)

Table (5): Post-operative consequences among studied cancer cases.

Item	Studiedcases(N=24)	
	No.	%
Need for ICU		
Absent	6	25
Present	18	75
Post-operative embolism		
Absent	23	95.8
Present	1	4.2
Mortality		
Died	0	0.0
Survived	24	100.0

Table (6): Relation between Sex distribution and postoperative complication among the studied cancer cases.

Variables	Sex				P- value
	Male *(n=18)*		Female *(n=6)*		
	No.	%	No.	%	
Wound infection					
Absent	12	100.0	2	66.7	0.200 (NS)
Present	0	0.0	1	33.3	
Leak					
Absent	18	100.0	6	100	0.200 (NS)
Present	0	0.0	0	0.0	
Haematemesis					
Absent	18	100.0	5	83.3	0.371 (NS)
Present	0	0.0	1	16.7	
Need for ICU					
Absent	4	22.3	2	33.3	1.000 (NS)
Present	14	77.7	4	66.7	
Post-operative embolism					
Absent	17	95.8	6	100.0	1.000 (NS)
Present	1	4.2	0	0.0	

NS:Non-significant

Table (7): Relation between type of operation and site of tumor among the studied cancer cases.

Typeof operation	Site of stomach cancer						X^2	p- value
	Proximal *(n=0)*		Mid body *(n=3)*		Distal *(n=21)*			
	No.	%	No.	%	No.	%		
Distal gastrectomy	0	0.0	0	0.0	21	87.5	19.09	0.004* (HS)
Subtotal gastrectomy	0	0.0	0	0.0	0	0.0		
Total gastrectomy	0	0.0	0	0.0	0	0.0		
Partial gastrectomy	0	0.0	3	12.5	3	12.5		

X^2:Chi-squaretest *HS: HighlySignificant*

DISCUSSION:

The treatment of early stomach malignancies in the Far East has been extensively facilitated by laparoscopic surgery, particularly laparoscopic distal gastrectomy, which offers numerous benefits in comparison to open surgery. However, although it was first described in 1999, laparoscopic total gastrectomy (LTG) with lymph node dissection is less common and more difficult to do. Within a limited operating field, the technique carries a considerable risk of bleeding and requires a technically complex anastomosis. But with to advancements in technology and better equipment, LTG is currently being utilized more frequently to treat stomach cancer[8].

The surgical results and viability of laparoscopic gastrectomy were the focus of our investigation. 24 patients with stomach cancer who visited the outpatient clinic of the hospitals affiliated with Zagazig University were included in this study. They were brought into the GIT surgical unit. 18 (80%) of the patients were male, and the remaining 6 (20%) were female. The patients' ages ranged from 38 to 67 years, with a mean age of 55.87 ±7.37 years. Okada et al. [9] in a study of the epidemiology of gastric cancer, consistent with our findings, patients diagnosed with stomach cancer were primarily male (73.2%), with an age range of 60-69 years.

Initially, the extended operating times associated with laparoscopic gastrectomy operations were the main source of criticism. This information ignored the positive financial impact of patients undergoing laparoscopic gastrectomy having shorter hospital stays. Operative time has reduced as a result of technical advancements and technique development [10].

We found that the mean operative time was (251.87± 24.14min) based on our studies. This is close to the times (258 ± 54), (289 ± 89), and (211 ± 23) min.) that were reported by Lee et al. [11], Jeong et al. [12], and Siani et al. [13]. However, this duration is greater than that reported by Kim et al. [14] and Topal et al. [15], whose respective operating times were (187 ± 60) and (144 ± 104.3) min.

Our study's extended operating duration is a result of our early laparoscopic gastrectomy experience. The learning curve of laparoscopic surgery for stomach cancer was studied by Zhang and Tanigawa [16] who came to the conclusion that 60–90 cases of experience were needed to finish the learning curve and that one learning curve item that improved with greater experience was operative time.

A benefit of laparoscopic surgery over open surgery is the reduced requirement for blood transfusions and blood loss [17]. In comparison to studies comparing open and laparoscopic gastric cancer management, our results indicated an intraoperative blood loss of only 238 ± 40.08 ml. Siani et al. [13] reported intraoperative losses of 495 ± 190 ml in the open group and 250 ± 150 ml in the laparoscopic group.

The regular use of contemporary energy devices during laparoscopic surgery, such as the Ligasure TM V or Harmonic® scalpel, may reduce blood loss because they minimise minor oozing, which compromises the laparoscopic view. As a result, dissection must be carried out using these instruments, which maximise accurate tissue cutting and coagulation[18].

Xiong et al. [8] investigated the overall complication rate was considerably reduced in the laparoscopic group as compared to the open group after 14 studies comparing open and laparoscopic gastrectomy (OR=0.73, 95%CI: 0.57-0.92, P = 0.009).

One patient with poorly controlled diabetes mellitus (4.2%) experienced a wound infection as one of the post-operative complications in our study. One instance (4.2%) of post-operative haematemesis was also reported, and it was treated conservatively.Kim et al. [14] reported that three cases (1.45%) of haematemesis in the open group and none in the laparoscopic group were reported by Kim et al. [14]. They clarified that this was made possible by ongoing improvements in laparoscopic stapling techniques as well as by applying less force to the stomach remnant during laparoscopy to prevent vascularity damage.

When comparing laparoscopic gastrectomy to open gastrectomy, Xiong et al.'s [8] reported that the length of hospital stay showed that the former was linked to a noticeably shorter stay following surgery.

The average length of hospital stay in our study was 6.53±3.7 days, with a range of 4–20 days. The case of leakage resulted in the longest hospital stay of 20 days, which is consistent with the findings of Kim et al. [14] who found that the hospital stay for the laparoscopic group in their study was 7 days.

Surgical resection is the chosen treatment for stomach cancer; however, opinions on the extent of resection and the appropriateness of lymphadenectomy during a gastrectomy are still under dispute. However, a recent randomised study confirmed the survival benefit of D2 lymph node dissection even after taking into consideration the morbidity of the procedure[19].

A minimum of 15 lymph nodes (LNs) should be retrieved to prevent stage migration, according to the National Comprehensive Cancer Network (NCCN) guidelines version 2. However, there is no set minimum number of LNs needed for proper staging of stomachcancer [20]. In our study, the median number of lymph nodes extracted was eight to nineteen, while the mean number was fourteen.88 ± 2.42 lymph nodes.

There was no recurrence throughout the six-month short-term follow-up period in our study, and all of our cases had free resection borders. This demonstrates the laparoscopic gastrectomy's oncological safety. However, a large-scale randomised experiment with long-term follow-up is required to validate these results.

CONCLUSIONS:

When treating gastric cancer, laparoscopic distal gastrectomy is safe, efficient, and has certain benefits over open conventional gastrectomy, including a shorter hospital stay, less wound-related complications, less intraoperative blood loss, and a quicker recovery of gastrointestinal motility all at the expense of a longer operating time.

The short-term oncological outcomes of a laparoscopic gastrectomy are satisfactory. Nonetheless, it is imperative to create well-planned, sufficiently powered, prospective, multicenter, randomised controlled studies that examine LG and provide sufficient long-term follow-up.

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