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ORIGINAL ARTICLE

Gastric Gastrointestinal stromal tumors (GISTs): Can it be effectively managed by laparoscopic resection under endoscopic guidance? (Zagazig university experience)

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ABSTRACT

Background: Gastrointestinal stromal tumor (GISTs) is the most common mesenchymal neoplasms of the GI tract. Surgical resection is the main treatment modality. Laparoscopic and endoscopic cooperative surgery (LECS) for gastric (GIST) was established as a type of minimal invasive resection and is now widely used worldwide. **Patients and methods**: The study is an interventional single-arm clinical trial. It was conducted in Onco-Surgery Unit, General Surgery Department, Zagazig University Hospitals with a sample size of12 cases from March to September 2023. **Results:** 12 patients were eligible in this study. The operative parameters indicated that the mean operative time was170.83 minutes, and the mean blood loss was 77.92 ml. The study reported a 91% completion rate, with conversion of only one case to open surgery. All cases had free surgical margins, and there were no major complications or mortalities. The postoperative outcomes showed a mean time to first flatus of 1.58 days and a mean time to oral intake of 2.91 days. The mean postoperative hospital stay was 5.08 days. The study reported a few postoperative complications, including gastric stenosis and delayed gastric emptying one case and intraperitoneal bleeding in another case. **Conclusions:** (LECS) is a minimally invasive and safe procedure for the resection of gastric GISTs. It offers the advantage of preserving the anatomical function of the stomach while achieving complete tumor removal with minimal margins. By combining the benefits of both laparoscopic and endoscopic techniques, LECS provides a synergistic effect that can potentially improve patient outcomes and quality of life.

INTRODUCTION

GISTs are the most prevalent mesenchymal tumors that originate in the gastrointestinal tract. LECS has emerged as a significant advancement over traditional laparoscopic surgery for the local resection of gastric GISTs. LECS integrates endoscopic surgery, such as endoscopic mucosal incision and laparoscopic surgery, providing a minimally invasive approach for resection. The original LECS method, known as 'classical LECS,' was reported by Hiki in 2008[1], and subsequent modified methods have been developed, including laparoscopic assisted endoscopic full-thickness resection (LAEFR), inverted LECS, and a combination of laparoscopic and endoscopic approaches to neoplasia with a non-exposure technique (CLEAN-NET) and non-exposed endoscopic wall-inversion surgery (NEWS).

LECS is recommended for gastric GISTs with a tumor size <50 mm in diameter, regardless of the tumor location. It has been acknowledged as a safe, feasible, and advantageous procedure that promotes the progression of surgical treatment for gastrointestinal neoplasms, particularly GISTs. However, there are variations among these procedures with their own pros and cons. Therefore, further studies including large sample prospective clinical trials are necessary to confirm the feasibility and stability of these treatment methods, especially concerning safe and long-term outcomes[2].

LECS has displayed great potential as a safe and effective surgical approach for gastric GISTs. However, ongoing research is needed to further explore its capabilities and refine its application to ensure positive long-term outcomes[3].This hybrid technique is still not widely used in Egypt. So, this study was conducted to assess the oncological safety of LECS for gastric (GIST) and its potential oncology related problems.

PATIENTS AND METHODS

The study is a clinical trial conducted on patients with a diagnosis of gastric GIST admitted to Zagazig University hospitals. The sample size for the study is 12 cases, which were selected over a 6-month study period, at a rate of approximately 2 cases per month.

The inclusion criteria for the study are patients with a diagnosis of gastric GIST who were admitted to Zagazig University hospitals. However, there are exclusion criteria that were applied, including contraindications to laparoscopic surgery such as intolerance to general anesthesia or severe coagulopathy. Patients who required emergent intervention or refused to provide informed consent were also excluded. Additionally, patients with GIST located near the cardia or pylorus were excluded from the study.

Surgical procedure
Preoperative preparation

The patient was instructed to 3 h of preoperative fasting for fluid and 6 h fasting for solid food.
prophylactic antibiotics were administrated with second-generation cephalosporins 30 min before surgery.

1- Anesthesia:

General anesthesia with endotracheal intubation.

2- Position:

The patient is placed in a supine position with his legs wide apart. The surgeon strands between his legs and the camera man and the second assistant on the RT side of the patient to hold the liver retractor. A third assistant may be needed on the Lt side of the patient to perform countertraction on momentum.

3- Ports:

We use two 10 mm ports; one for the camera, one for the main operator hand and two 5mm ports; one for liver retractor and the other for the third assistants.

4- We apply Co2 pneumoperitoneum of about 14 mm Hg and use vessel sealing device for devascularization of the resected part.

Figure 1: laparoscopic view during LECS showing serosa surface of gastric GIST

5- After good exploration of the abdomen to assess the respectability and operability of the tumor. Endoscopy was introduced to precisely localize the tumor.

Figure 2: endoscopic view of gastric GIST

6- After localization of the tumor site and making the appropriate decision of resection, devascularization of the targeted segment starts. Endoscopic aspiration of gas and any gastric residual to facilitate resection.

Figure 3: laparoscopic resection of gastric GIST

7- Laparoscopic resection:

Sequential bites of the stapler were taken under Endoscopic guidance to ensure good safety margins and presence of adequate residual gastric lumen for passage of food.

8- Extraction of specimen

When the mass was completely resected, it was retrieved in a bag through one of the port wounds. After dilatation and then a leakage test was employed

Figure 4: Extraction of the specimen

9- Stomach wound check.

After Laparoscopic closure, a leakage test was conducted using a combination of laparoscope and endoscope. Laparoscopically check if there are any bubbles coming out of the wound after flushing with water. We checked if there was wound bleeding, whether the suture was satisfactory and whether the gastric cavity had been deformed by the endoscope to ensure patency of the lumen and exclude Strictures.

10- Closure of the port wounds:

with a tube drain left beside the gastric remanent.

Specimen management

After the procedure, the specimen was checked visually to confirm the margin status. Then, immersed in a neutral 10% formalin solution.

Post-operatively:

Ambulance and clear liquids started when intestinal sounds were audible, followed by soft diet. Patients' vitals were monitored closely as well as monitoring for alarming symptoms e.g., hypotension, tachypnea, fever, peritonism, falling hemoglobin level or rising leukocytic count. Moreover, drain and urine outputs were followed up. The intra-peritoneal drain was removed when less than 50 cc was drained per 24 hours.

RESULTS

The demographic characteristics of the patients in the study 12cases including7 Male, 5 Female with mean age: 51.16 ± 14.31 year (33:78years). 5 cases were medically free, 3 Diabetic, 2 Hypertensive and 2 cases diabetic hypertensive. ASA classification: ASA I: 8 (66.7%), ASA II: 4 (33.3%). The mean preoperative BMI 27.25 ± 3.30(22:32). The mean operative time 170.83± 15.05(150: 200) minutes, The mean blood loss 77.9167 ml ±27.42(40: 125 ml).

The mean time to first flatus 1.58 ± 0.66 days (1:3) days, the mean time to oral intake was 2.91 ± 0.28(2:3) days. The mean postoperative hospital stays 5.08± 0.79 days (4:6) days.

The postoperative BMI 25.83 ± 1.85 (23-28) after one month. The postoperative complications in our study showed a case with gastric stenosis in the form of Glass-Hour deformity which was managed later by balloon dilatation. Intraperitoneal bleeding occurred in one case which was managed conservatively without need for blood transfusion. There were no cases of anastomotic hemorrhage, abdominal abscess, wound infection, or mortality during the postoperative follow-up period.

There was a statistically significant difference between pre and post BMI where there was significant decrease in BMI after operation as the mean baseline BMI was 27.25±3.30 and the mean post-operative BMI after one -month became 25.83±1.

Pathological Parameters:

Table 1: Tumor location

This table shows that greater curvature is the most common site of GIST followed by the fundus and to lesser extent lesser curvature and antrum.

Table 2: Tumor location

This table shows that greater curvature is the most common site of GIST followed by the fundus and to lesser extent lesser curvature and antrum.

Figure 5 post-operative specimens of gastric GIST

A: A 38-year-old man with Gastric GIST: Gastric portion measured 6x5x4 cm, with stitched end measured 7 cm in diameter. Serialling revealed submucosal greyish tan firm mass measured 4.5x4.5 cm, located 0.5 cm from stitched margin (red arrow), 0.1 cm from serosa.

B: A 78-year-old man with Gastric GIST: Sleeve gastrectomy specimen measured 6 cm long, 13 cm in greatest diameter. Attached greater omental measured 11x3 cm. Outer serosal surface (blue arrow) showed scattered tiny greyish white firm nodules (green arrow), ranging in size from 0.3x0.3 cm up to 1x1 cm. Cut section showed submucosal greyish white firm mass measured 5x5x4.5 cm, partially cystified, located 2 cm from the least surgical margin.

Table 1: Tumor location

Site	Frequency	
	(n)	%
Fundus	3	25
Lesser curvature	1	8.3
Greater curvature	7	58.3
Antrum	1	8.3

Table2: Tumor location

Site	Frequency	
	(n)	%
Fundus	3	25
Lesser curvature	1	8.3
Greater curvature	7	58.3
Antrum	1	8.3

Table 3: Pathological Parameters

Parameters		Frequency	
		n	1. %
Mitotic rate	<5	4	33.3
	5 ~ 10	6	50.0
	>10	2	16.7
CT size	<30 (mm)	4	33.3
	40:50 (mm)	5	41.7
	>50 (mm)	3	25.0
Immuno-Histo-Chemistry	CD 117	12	100
	DOG-1	11	91
	CD34	11	91
	SMA	1	8
	S-100	1	8
	Desmin	1	8
Fletcher Classification	Low risk	6	50.0
	Intermediate risk	4	33.3
	High risk	2	16.7
Maximum Size of resected tumors	30 (mm)	1	8.33%
	40 (mm)	4	33.33%
	50 (mm)	7	58.33%

Figure 5: laparoscopic view during LECS showing serosal surface of gastric GIST

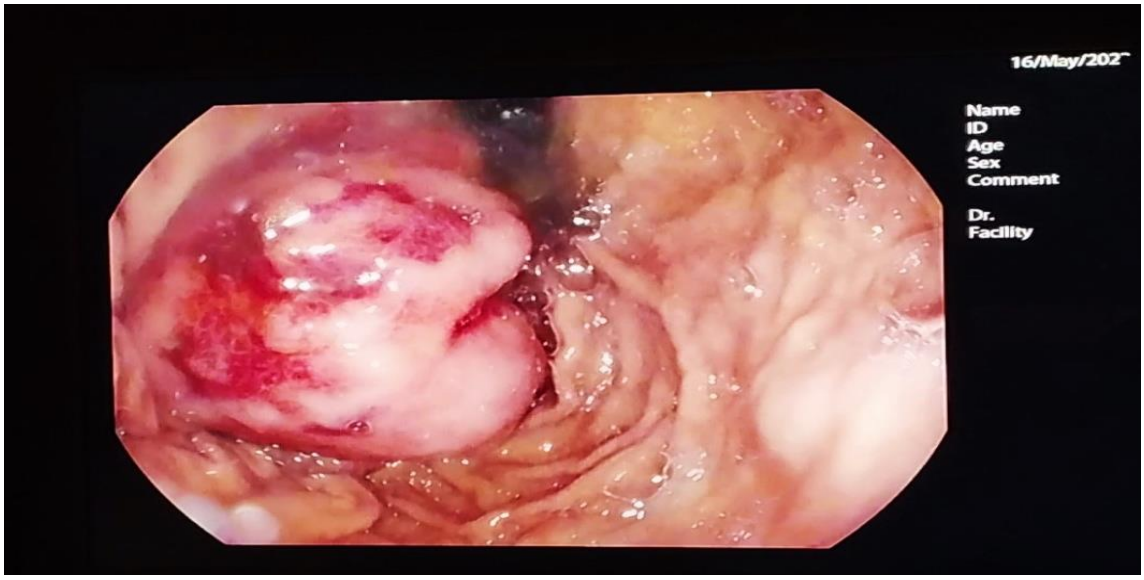

Figure 6: Endoscopic view of gastric GIST

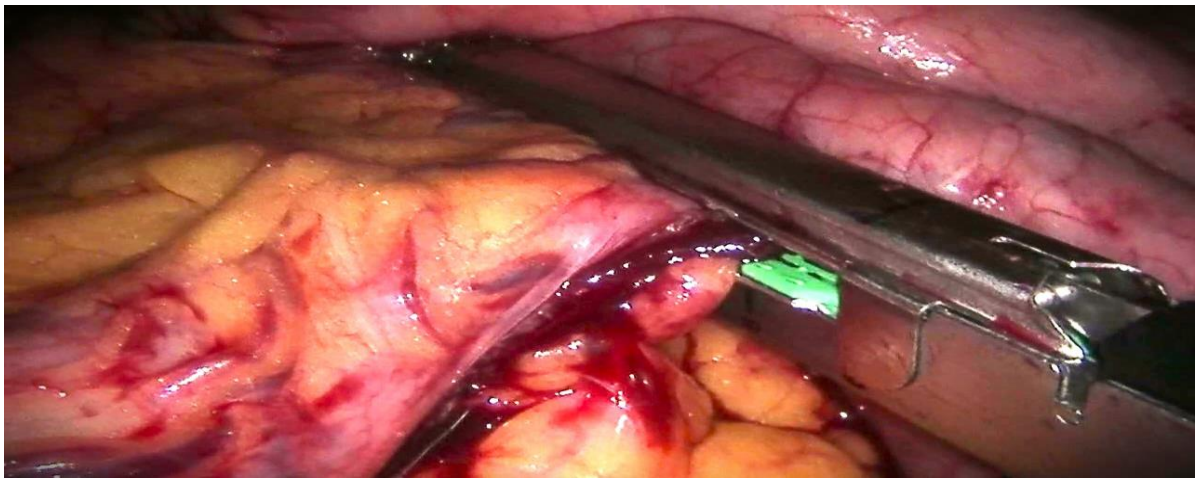

Figure 7: laparoscopic resection of gastric GIST

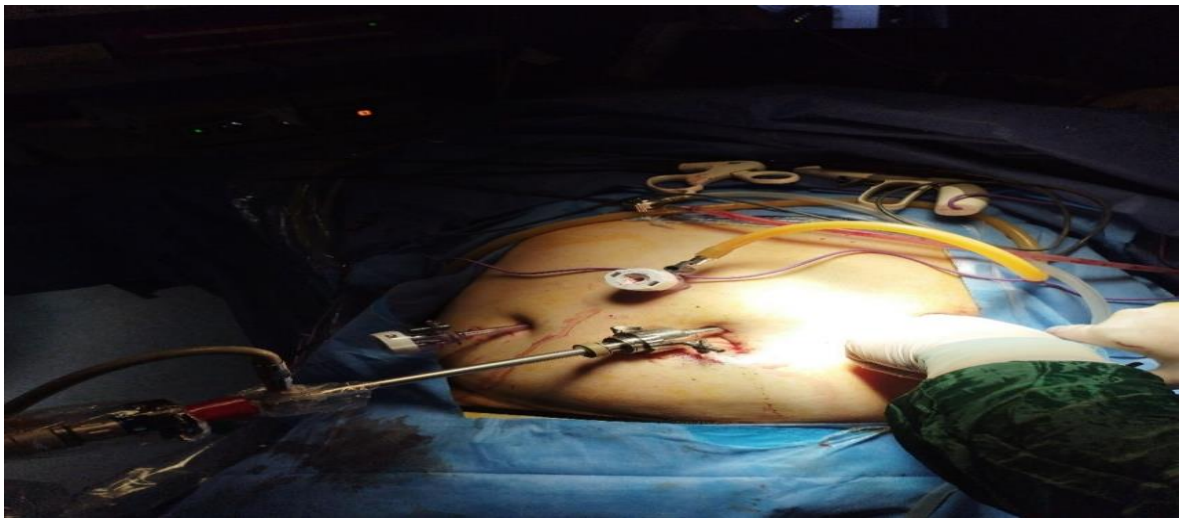

Figure 8: Extraction of the specimen

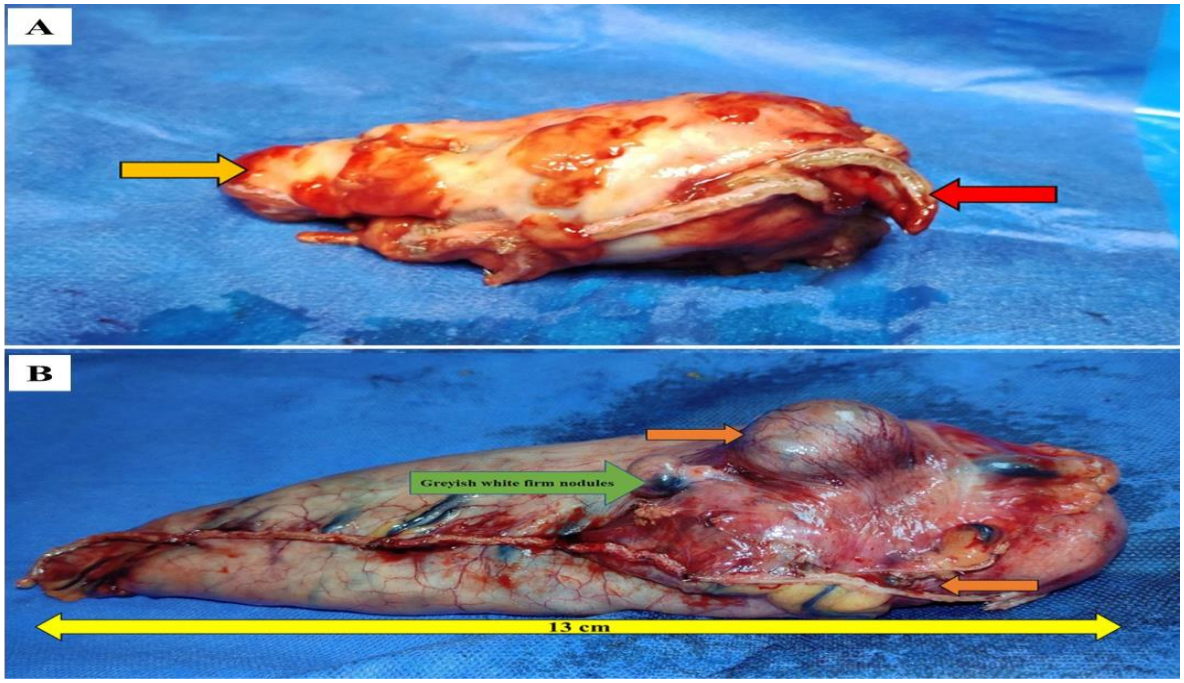

Figure 9: Post-operative specimens of gastric GIST

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DISCUSSION

The study conducted at Zagazig University Hospitals evaluated the feasibility and outcomes of LECS for gastric GISTs. LECS was found to be a safe and effective procedure, with 91% completion rate, with conversion of only one case to open surgery. The mean operative time was 170.83 minutes, with minimal blood loss and no need for blood transfusion. All cases had free surgical margins, and there were no major operative complications or mortalities. The mean time to first flatus was 1.58 days, and the mean time to oral intake was 2.91 days. The mean postoperative hospital stay was 5.08 days, which was shorter than in previous studies. The postoperative complications in our study showed a case with gastric stenosis in the form of Glass-Hour deformity which was managed later by balloon dilatation. Intraperitoneal bleeding occurred in one case which was managed conservatively without need for blood transfusion. There were no cases of anastomotic hemorrhage, abdominal abscess, delayed gastric emptying, wound infection, or mortality during the postoperative follow-up period.

The study highlighted the successful implementation of LECS in Egypt and demonstrated its potential as a minimally invasive approach for gastric GISTs. The findings were consistent with previous studies, confirming the safety and efficacy of LECS in achieving complete tumor resection while preserving gastric function. Further research and long-term follow-up studies are needed to validate these results and assess the oncological outcomes and long-term benefits of LECS for gastric GISTs.

In terms of the pathological characteristics of the gastric GIST cases, the most common site of the tumors in this study was the gastric body, mainly the greater curvature (58.3% of cases). The second most common site was the fundus (25% of cases). These findings differ slightly from other studies,

where the fundus was reported as the most common site in some studies and the gastric body (greater curvature or both greater and lesser curvature) as the most common site in others.

All cases in the study had negative surgical margins, indicating complete tumor resection. The mitotic index, which measures the rate of cell division, varied among the cases. Approximately 50% of cases had a mitotic rate of 5-10, 33% had a rate less than 5, and 16% had a rate greater than 10. These findings are consistent with other studies that reported a range of mitotic rates in gastric GISTs.

Using the risk categories proposed by Fletcher et al., the study classified the patients into different risk groups. Approximately 50% of patients were classified as being at very low risk, 33% at intermediate risk, and the remaining 17% at high risk. These risk categories help predict the behavior and prognosis of GISTs.

Immunohistochemistry was performed on all cases to evaluate the expression of specific markers. CD117 (also known as c-kit) was positive in 100% of cases, while DOG-1 and CD34 were positive in 91% of cases. Other markers such as SMA, S-100, and Desmin were positive in only one case (8%). These findings are consistent with previous studies that have identified CD117, DOG-1, and CD34 as reliable markers for the diagnosis of GISTs.

Comparing pre- and post-operative parameters, a statistically significant difference was found in BMI (body mass index). There was a significant decrease in BMI after the operation, with the mean baseline BMI of the cases group being 27.25 and the mean postoperative BMI after one month being 25.83. This indicates that the surgical intervention may have led to weight loss in the patients.

Overall, the pathological characteristics observed in this study align with previous research on gastric GISTs, confirming the importance of specific markers and risk stratification in determining the behavior and management of these tumors.

CONCLUSION

LECS is a minimally invasive and safe procedure that aims to preserve the anatomical function of the stomach while respecting lesions with minimal margins. It combines two advanced techniques, resulting in a synergistic effect that shows promise which would maintain subsequent patient's quality of life. However, despite the numerous advantages in terms of enhanced safety

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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