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Does Preoperative Laparoscopy for Gastrointestinal Tract Cancer Staging Alter Surgical Strategy? A Prospective Cohort Study

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ABSTRACT

Background: Laparoscopic staging has been shown in several recent trials to minimize the necessity for exploratory laparotomy significantly among gastrointestinal (GIT) tract cancers.

Objective: Studying the importance of laparoscopy in the staging of GIT cancers to be classified as resectable or unresectable, which helps avoid an unwanted laparotomy and its morbidities.

Subjects and Methods: At GIT, Liver and Laparoscopy Unit, General Surgery Department of Zagazig University Hospitals, 24 patients with proven gastrointestinal tract carcinoma were recruited. Patients were subjected to preoperative laparoscopic staging under general anesthesia for different GIT cancers found. Pathological examination was done and compared with the computed tomography (CT) and laparoscopy results with regard to the efficacy of staging **Results:** The receiver operating characteristic (ROC) curve analysis of CT results in comparison with pathological results was performed to assess the sensitivity and specificity of CT concerning the efficacy of staging. The area under the ROC curve (AUC) was 0.789, the sensitivity was 80% and specificity was 78.9%. The ROC curve analysis of preoperative laparoscopic in comparison with pathological results was performed to assess the sensitivity and specificity of CT concerning the efficacy of staging. The AUC of ROC was 0.763, the sensitivity was 80.0% and specificity was 73.7%. The laparoscopy was significant in assessing resectability with sensitivity of 88.2%, specificity of 85.7%, negative predictive value (NPV) of 75% and positive predictive value (PPV) of 93.8% with accuracy of 87.5%

Conclusion: Preoperative laparoscopy is considered a golden key in the staging of GIT cancers (to be classified as resectable or unresectable). Moreover, we found that this benefit aids in preventing the need for a laparotomy.

Keywords: Preoperative Laparoscopy, Gastrointestinal Tract Cancer, Staging.

INTRODUCTION

Cancers of the esophagus, stomach, biliary system, pancreas, small intestine, large intestine, rectum, and anus are all considered to be part of the GIT, which is what the term "gastrointestinal cancer" alludes to. Depending on the damaged organ, symptoms may include a blockage (resulting in choking or diarrhea) or abnormal bleeding [(1)].

For a proper diagnosis, endoscopy and a tissue biopsy are often necessary. Tumor location, cancer cell type, and metastasis (the spread of cancer to other parts of the body) all have a role in determining the best course of treatment. The prognosis is also dependent on these aspects [(2)].

Overall, more malignancies and fatalities from cancer occur in the digestive system and its auxiliary organs (the pancreas, liver, and gall bladder). The prevalence of various types of stomach cancer varies greatly among regions [(3)].

GIT malignancy staging goes beyond a thorough physical examination, medical history, and standard investigations like endoscopy, biopsy, and sonography. In addition to many other modern procedures, they include endoluminal ultrasonography (EUS), computed tomography, and surgical laparoscopy to check the whole abdominal cavity and acquire an abdominal lavage in facilities [(4)].

After a diagnosis, preoperative assessment to establish the tumor's characteristics and extent is critical in deciding whether or not to proceed with a primary operation. If complete resection is predicted, the patient's prognosis can only be improved by surgery. Only patients with tumors found to be unresectable will benefit from the frequently time-consuming and expensive diagnostic techniques if surgery is regarded as the only appropriate therapy approach [(5)].

Laparoscopic staging can determine the degree of metastasis, allowing for the avoidance of unnecessary laparotomies. Laparoscopic staging has been shown in several recent trials to minimize the necessity for exploratory laparotomy significantly [(6)].

Our objective was studying the importance of laparoscopy in the staging of GIT cancers to be classified as resectable or unresectable, which helps avoid an unwanted laparotomy and its morbidities.

SUBJECTS AND METHODS

Subjects:

At Gastrointestinal, Liver and Laparoscopy Unit, General Surgery Department of Zagazig University Hospitals, 24 patients with proven gastrointestinal tract carcinoma were recruited in this prospective cohort clinical study.

Ethical consent:

Zagazig University's Institutional Review Board (IRB) #9500-17-4-2022 accepted the study after receiving written informed consent from all participants. This work has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

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Inclusion Criteria: Patients with proven gastrointestinal tract carcinoma after diagnostic workup, and both sexes.

Exclusion Criteria: Patients who have scan findings indicative of unresectability (e.g., liver metastases, ascites).

All patients have gone through:

A. History taking: Full clinical history taking was obtained from each patient. Patient demographics, previous surgical history were obtained.

B. Clinical Examination: Both general and local examination were performed to every patient. Local examination included perineal and perianal inspection, palpation, digital rectal examination in males and rectal and pervaginal in females, and proctoscopic evaluation.

C. Imaging: Radiological testing in the form of a CT scan was performed. Patients were given oral and intravenous contrast prior to the examination, and a 16-slice CT scanner was used.

D. Laboratory investigations:

Patients were subjected to preoperative laparoscopic staging under general anaesthesia for different GIT cancers found. Pneumoperitoneum was initiated through the umbilicus by Veress needle or by open Hasson technique. The umbilical cord was used to introduce a 10 mm trocar, which served as the camera's port. Additional trocars of 5 mm were placed in the left and right upper quadrants at the mid-clavicular line.

Malignant deposits and ascites were looked for by doing a thorough examination of the abdominal cavity and its linings (the liver, diaphragm, omentum, partial peritoneum, and visceral peritoneum).

After lifting both lobes, the underside of the liver could be examined. Serosal infiltration, direct infiltration, direct invasion of the liver, and enlargement of lymph nodes were evaluated by lifting the left lateral portion of the liver.

The laparoscope was inserted through a short incision at the gastrocolic ligament to view the smaller sac, posterior gastric wall, pancreas, and celiac axis. The genitourinary system (or "pelvis") was checked out. If necessary, a biopsy sample was collected.

Pathological examination:

In terms of staging, it is unparalleled. The effectiveness of staging was compared with CT and laparoscopic findings.

Statistical analysis:

In order to analyze the data acquired, Statistical Package for the Social Sciences (SPSS) version 20 was used to execute it on a computer. In order to convey the findings, tables and graphs were employed. The quantitative data were presented in the form of the mean, standard deviation, median, range, and confidence intervals. The qualitative data were presented as frequency and percentage. The significance of a P value of 0.05 or less was determined.

RESULTS

A total sample of 24 participants were included in this study with the mean age of 63.3± 8.2 years, ranging from 50 to 75 years with the median of 62 years. Among them 54.2% were males and 45.8% were females. Among the participants the most common sites were stomach cancer and colorectal cancer. The major presentation was abdominal pain (Table 1).

Table (1): Basic characteristics of the participated group

Variable		N= 24
Age (years)	Mean ± SD	63.3± 8.2
	Median (Range)	62 (50, 75)
Gender	Male, n (%)	13 (54.2)
	Female, n (%)	11 (45.8)
Site	Stomach cancer n (%)	5 (20.8)
	Lt colon cancer n (%)	4 (16.7)
	Splenic flexure mass n (%)	3 (12.5)
	Colorectal cancer n (%)	5 (20.8)
	Pancreatic cancer n (%)	1 (4.2)
	Esophageal cancer n (%)	4 (16.7)
	Hepatobiliary cancer n (%)	2 (8.3)
Major presentation	Abdominal pain n (%)	13 (54.2%)
	Abdominal distension n (%)	7 (29.2%)
	GIT symptoms n (%)	8 (33.3%)
	Abdominal mass n (%)	4 (16.7%)
	Loss of weight n (%)	10 (41.7%)

Among the participants, 54.2% had lymph node metastasis (Table 2).

Table (2): Laparoscopic findings among the participated group

Variable		N= 24 N (%)
LN involvement	Yes	13 (54.2)
	No	11 (45.8)
Peritoneal nodules	Yes	3 (12.5)
	No	21 (87.5)
Liver metastasis	Yes	2 (8.3)
	No	22 (91.7)

This table shows the staging distribution among the studied group. 20.8% of the patients were stage IIIA on CT and laparoscopic while 16.7% on pathological. 20.8% of the patients were stage IIIB on pathological and laparoscopic while 12.5% on CT. 20.8% of the patients were stage IV on CT and pathological while 16.7% on laparoscopic (Table 3).

Table (3): Staging distribution among the participated group

Variable	CT N= 24 N (%)	Laparoscopic N= 24 N (%)	Pathological N= 24 N (%)
Stage I	4 (16.7)	4 (16.7)	4 (16.7)
Stage II A	4 (16.7)	3 (12.5)	3 (12.5)
Stage II B	3 (12.5)	3 (12.5)	3 (12.5)
Stage III A	5 (20.8)	5 (20.8)	4 (16.7)
Stage III B	3 (12.5)	5 (20.8)	5 (20.8)
Stage IV	5 (20.8)	4 (16.7)	5 (20.8)

When evaluating CT for its usefulness in staging, the sensitivity and specificity were evaluated using ROC curve analysis (Table 4 and figure 1).

Table (4): Role of CT in staging of GIT cancer

Variable	AUC	Sensitivity	Specificity	Sig.
CT	78.9%	80.0%	78.9%	0.001*

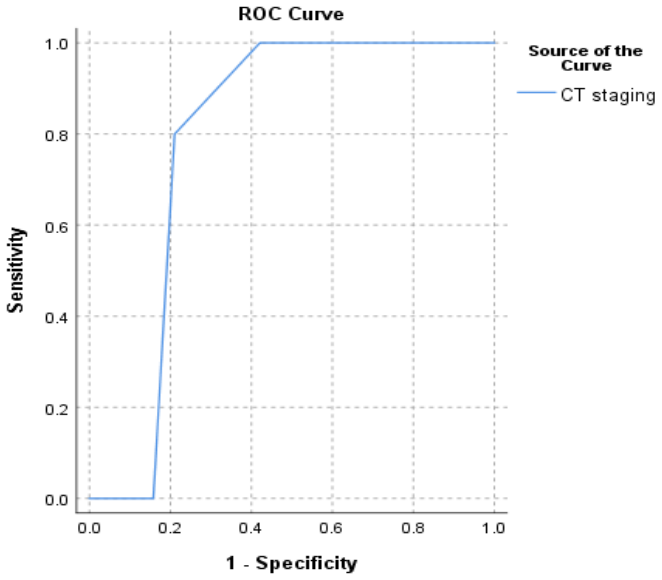


Figure (1): ROC (receiver operating characteristic curve) analysis of CT results in comparison with pathological results as a gold standard for staging

When evaluating preoperative laparoscopy for its usefulness in staging, the sensitivity and specificity were evaluated using ROC curve analysis (Table 5 and figure 2).

Table (5): Role of preoperative laparoscopy in staging of GIT cancer

Variable	AUC	Sensitivity	Specificity	Sig.
Laparoscopic	76.3%	80.0%	73.7%	0.006*

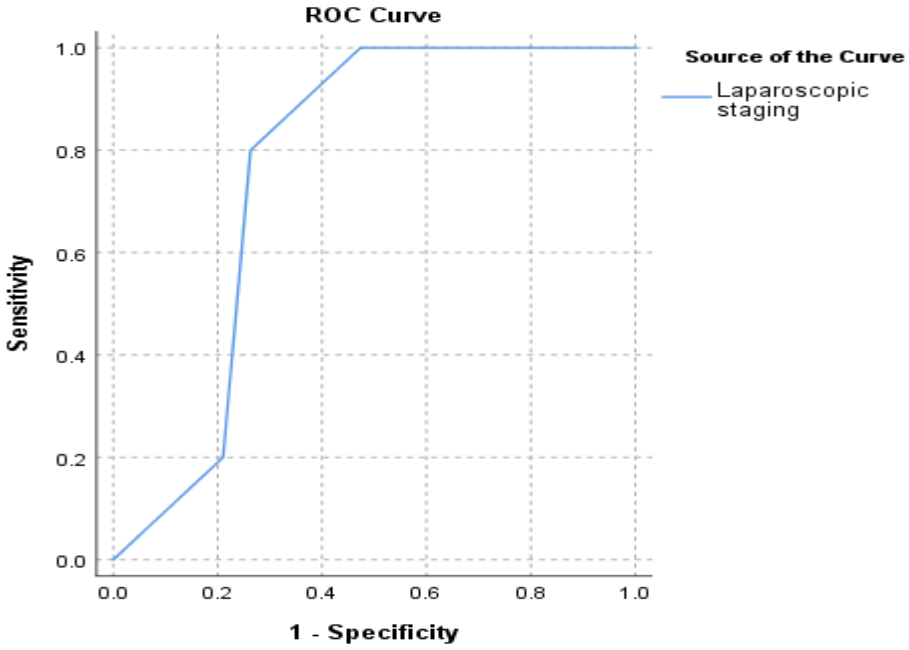


Figure (2): ROC curve analysis of preoperative laparoscopic in comparison with pathological results as a gold standard for staging.

In the studied patients, 16/17 patients resectable by pathological were found to be resectable by laparoscopy with true negative was 100% (Table 6).

Table (6): Validity and diagnostic value of laparoscopy to assess resectability

Laparoscopy	Histopathology				Total	P
	Resectable (N=17)		Unresectable (N=7)			
	N	%	N	%		
Resectable	16	94.1%	0	--	16 (66.7%)	<0.001
Unresectable	1	5.9%	7	100%	8 (33.3%)	
Total	17	100%	7	100%	24	

Statistic	Value	95% CI
Sensitivity	94.1%	71.31% - 99.85%
Specificity	100%	59.04% - 100%
Positive Predictive Value (PPV)	100%	---
Negative Predictive Value (NPV)	87.5%	51.11% - 97.91%
Accuracy	95.8%	78.88% - 99.9%

In the studied patients, 15/17 patients resectable by pathological were found to be resectable by CT with true negative was 85.7% (Table 7 and figure 3).

Table (7): Validity and diagnostic value of CT to assess resectability

CT	Histopathology				Total	P
	Resectable (N=17)		Unresectable (N=7)			
	N	%	N	%		
Resectable	15	88.2%	1	14.3%	16 (66.7%)	<0.001
Unresectable	2	11.8%	6	85.7%	8 (33.3%)	
Total	17	100%	7	100%	24	

Statistic	Value	95% CI
Sensitivity	88.24%	63.56% - 98.54%
Specificity	85.71%	42.13% - 99.64%
Positive Predictive Value (PPV)	93.75%	70.79% - 98.93%
Negative Predictive Value (NPV)	75%	44.08% - 97.95%
Accuracy	87.5%	67.64% - 97.34%

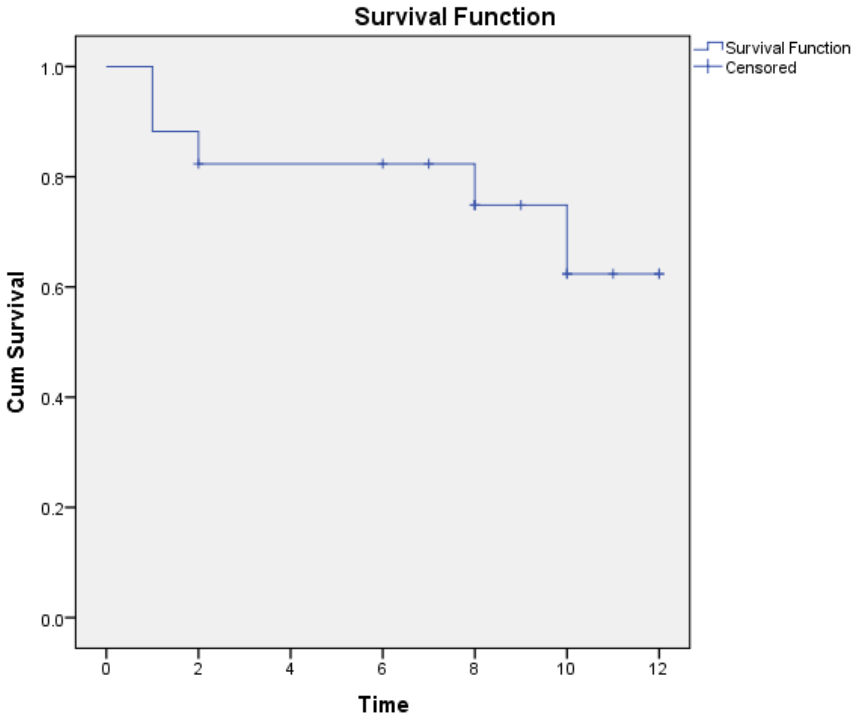
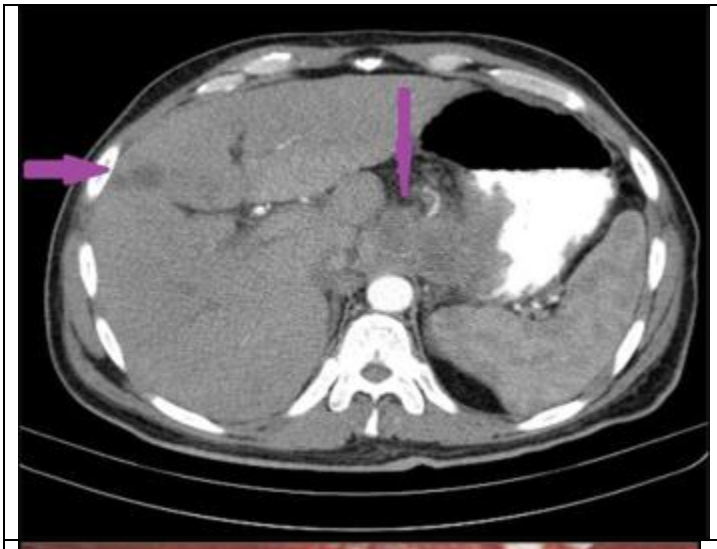


Figure (3): Kaplan Meier survival curve depicting disease-free survival in resectable GIT cancer patients

Disease free survival is shown in table 8.

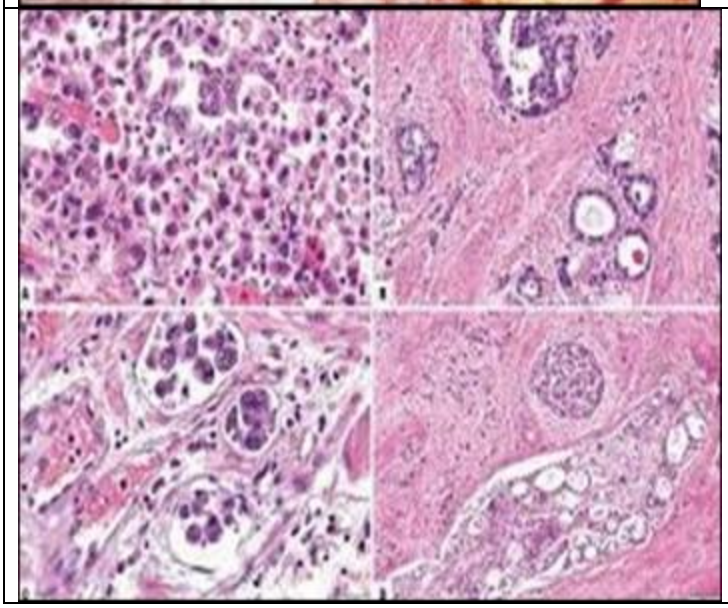
Table (8): Disease free survival (DFS)

Mean			25% percentiles median		75% percentiles median	
Estimate	S.E.	95% Confidence Interval	Estimate	S.E.	Estimate	S.E.
9.154	0.517	8.141 - 10.167	10	0.760	8	0.449



(A) CT scan showing gastric cancer

(B) laparoscopic view of gastric cancer



(C) pathological examination of gastric cancer patient

Figure (4): CT scans, laparoscopic view and pathological examination of 1 case

DISCUSSION

Gastrointestinal cancer refers to malignancies that form in the esophagus, stomach, biliary system, pancreas, small intestine, large intestine, rectum, and anus. Depending on the affected organ, you may experience complications like obstruction (making it hard to swallow or urinate) or abnormal bleeding [7].

According to **Lopez *et al.*** [8] by determining the extent of metastases using laparoscopic staging, needless laparotomies can be avoided. Recent studies have demonstrated that laparoscopic staging can considerably reduce the need for exploratory laparotomies [8].

Our study was a prospective cohort study, recruited 24 patients with proven gastrointestinal tract carcinoma at the GIT, Liver and Laparoscopy Unit, General Surgery Department, Zagazig University Hospital. It was aiming to study the importance of laparoscopy in the staging of GIT cancers to be classified as resectable or unresectable, which helps avoid an unwanted laparotomy and its morbidities.

A total sample of 24 participants were included in this study with the mean age of 63.3± 8.2 years, ranging from 50 to 75 years with the median of 62 years. Among them 54.2% were males and 45.8% were females. Among the participants 20.8% had stomach cancer, 16.7% had left colon cancer, 12.5% had splenic flexure mass, 20.8% had colorectal cancer, 4.2% had pancreatic cancer, 16.7% had esophageal cancer and 8.3% had hepatobiliary cancer. The major comorbidity was smoking (37.5%), followed by hypertension (29.2%) and 25% of the patients had history of surgery.

On the other hand, **Hosogi *et al.*** [9] conducted a similar study in which the median age was 67 years (range, 26–89), and 80 (67%) patients were males.

In our study, 16.7% of the patients were stage I on all methods, 16.7% were stage IIA on CT and 12.5% on laparoscopic and pathological, 12.5% were stage IIB on all methods. 20.8% of the patients were stage IIIA on CT and laparoscopic while 16.7% on pathological. 20.8% of the patients were stage IIIB on pathological and laparoscopic while 12.5% on CT. 20.8% of the patients were stage IV on CT and pathological while 16.7% on laparoscopic.

Regarding the findings of **Sobin** [10] The TNM classification found that the depth of primary tumor invasion was T3 in 17 (14%), T4a in 85 (71%), and T4b in 18 (15%), and that the clinical stage was described as stage II in 13% of cases, stage III in 43% of cases, and stage IV in 47% of cases.

The ROC curve analysis of CT results in comparison with pathological results was performed to assess the sensitivity and specificity of CT concerning the efficacy of staging. The AUC of ROC was 0.789, the sensitivity was 80% and specificity was 78.9%. The ROC curve analysis of preoperative laparoscopic in comparison with pathological results was performed to assess the sensitivity and specificity of laparoscopy concerning the efficacy of staging. The AUC of ROC was 0.763, the sensitivity was 80.0% and specificity was 73.7%.

In the studied patients, 16/17 patients resectable by pathological were found to be resectable by laparoscopy with true negative was 100%. The laparoscopy was significant in assessing resectability with sensitivity of 94.1%, specificity of 100%, NPV of 87.5% and PPV of 100% with accuracy of 95.8%. 15/17 patients resectable by pathological were found to be resectable by CT with true negative was 85.7%. The laparoscopy was significant in assessing resectability with sensitivity of 88.2%, specificity of 85.7%, NPV of 75% and PPV of 93.8% with accuracy of 87.5%.

Our study is considered from the novel researches for estimation of importance of laparoscopy in the staging of GIT cancers to be classified as resectable or unresectable, which helps avoid an unwanted laparotomy and its morbidities.

The identification rate of metastatic disease using surgical laparoscopy (SL) for patients with resectable advanced GIT cancer has been reported to be between 21 and 31 percent. All locoregional cancers should undergo SL, according to National Comprehensive Cancer Network (NCCN) guidelines [11].

Furthermore, **Tsuburaya *et al.*** [12] in recent years, SL has grown increasingly popular due to the fact that it allows patients with incurable metastases to avoid a laparotomy that is usually unneeded; nonetheless, its ideal indication now limits SL to patients who are at an exceptionally high risk of developing metastatic disease.

With this kind of judicious approach, patients with resectable tumors can avoid undergoing laparoscopy if it isn't absolutely essential. This has the potential to save time and money while also avoiding the rare but potentially dangerous complications of SL. Reportedly good candidates for SL include patients with clinical T4 tumors, big infiltrating type-3 and type-4 tumors, and tumors with LN metastases [9].

Tsuchida *et al.* [13] demonstrated a strong correlation between P/CY positivity and tumor site encompassing three sections (64%), macroscopic types 3, 4, or 5 (43%), and positive LN metastases (40%) in a sample of 231 cT4M0 patients.

In addition, **Miki *et al.*** [14] P/CY positivity was identified in 53.4% of 88 individuals with cM0, type-4, and big (>8 cm) type-3 tumors. In a group of patients with tumors 5 cm and/or with bulky N, they found that type-4 tumors and diffuse-type tumors were both independent risk factors for P/CY1.

Yamagata *et al.* [15] reported detection rates of 18.4-11.0% for clinically undetected peritoneal metastases with staging laparoscopy (SL). The varied

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SL study indications are the primary cause of the wide variation in detection rates. Due to the extremely high rates of both early and late-stage GIT cancer in the East, SL is often reserved for a restricted group of patients.

SL is also commonly performed in the West, though its indications vary between centres. One purported benefit is preventing unneeded laparotomies by spotting M1 illness that is not visible on CT. Trocar injuries, metastases to the port site, and immunologic impairment are among drawbacks that have been reported in Western research organisations [(2)].

CONCLUSION

We concluded that preoperative laparoscopy is considered a golden key in the staging of GIT cancers (to be classified as resectable or unresectable). We also concluded that this advantage helps in avoiding an unwanted laparotomy. We recommend considering preoperative laparoscopy as a tool to achieve early staging of GIT cancers and paying attention to this fact while outlining the recent guidelines for diagnosis of various GIT cancers. In addition, further studies must be done to analyse the role of preoperative laparoscopy in the staging of GIT cancers.

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