

Original Research Article

Role of staging laparoscopy in upstaging CT findings and influencing treatment decisions in gastric cancers

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ABSTRACT

Background: It is estimated that 990000 new gastric cancer (GC) cases occur in the world annually. The aim of this study was to examine the accuracy of laparoscopy in staging patients with gastric cancer in comparison with preoperative computed tomography (CT) examination and to determine the influence of staging laparoscopy on treatment decisions in gastric cancers.

Methods: This was a prospective study conducted in a tertiary care hospital between August 2014 and February 2016. Thirty patients out of a series of 60 patients with gastric adenocarcinoma underwent a preoperative staging CT followed by a staging laparoscopy. The strengths of the agreement between the CT stage, the laparoscopic stage, and the final histopathological stage were determined by the weighted Kappa statistic (Kw). The number of patients with treatment decision-changes was counted.

Results: The strengths of agreement between the CT stage and the final histopathological stage were Kw- 0.314 (95% confidence interval [CI]; 0.03-0.66; $P \geq 0.0001$) for T stage and 0.00 (95% CI; 0.0-0.00) for M stage, compared with 0.668 (95% CI; 0.39-0.98; $P \geq 0.0001$) and 1.00 (95% CI; 1.0-1.0; $P \geq 0.0001$) for the laparoscopic T and M stages, respectively. Unsuspected metastases that were not detected by CT, were found in 12 patients at laparoscopy, all of whom had T3 or T4 locally advanced tumors evident on CT.

Conclusions: Preoperative laparoscopic staging of gastric cancer is indicated for potential surgical candidates with locally advanced disease in the absence of metastases on CT and influences treatment decision making apart from preventing unnecessary laparotomies.

Keywords: Gastric cancer, Staging laparoscopy, Computed tomography CT

INTRODUCTION

It is estimated that 990000 new gastric cancer (GC) cases occur in the world annually.¹ In India, the incidence rate of gastric is low compared to that in western countries, and the number of new cases is approximately 34,000. Due to the absence of a mass screening program, more than 80% of all Indian cases are discovered at an advanced stage. Despite significant improvement in preoperative tumour staging, many patients with gastric malignancies are found at exploration to be unable to

undergo resection. Despite sophisticated new imaging techniques (trans-abdominal and endoscopic ultrasound, CT scan, MRI and more recently PET-CT), peritoneal tumour spread and occult liver and lymph node metastases are only detected during surgery in many patients.

Staging by conventional imaging techniques is fraught with limitations and often results in under staging and unnecessary laparotomy. Computed tomography (CT) scanning is the mainstay of staging and is useful in

assessment of hepatic metastasis, ascites and lymphadenopathy. However, CT scans miss 30% to 45% of peritoneal and liver nodules especially if these are smaller than 5mm. It is estimated that CT scan staging has an accuracy of 50% to 65%. Laparoscopy allows direct visualization of the primary tumour as well as assessment of the liver and peritoneal cavity. Laparoscopy is especially sensitive for detecting small peritoneal hepatic seedlings not detected by CT scan. It has emerged as the staging modality that is more sensitive and specific than other available imaging modalities in this respect. Diagnostic laparoscopy has been advocated to select patients for neoadjuvant therapy as in EORTC 40954 protocol.²

Clinically, underestimation of tumour staging by imaging may lead to unnecessary laparotomies. In patients with metastatic disease, life expectancy is limited and as such, if possible, laparotomy should be avoided. The aim of laparoscopic staging is to mimic staging at open exploration while minimizing morbidity, enhancing recovery, and thus allowing for quicker administration of neo-adjuvant/palliative therapies.

The aims of this study, was to study the percentage of cases deemed operable on CT abdomen and were upstaged based on staging laparoscopy and to compare this stage with the final true histopathological stage.

METHODS

This is a prospective study conducted on 30 (60) patients of endoscopic and biopsy proven stomach carcinoma that were found to be operable on CT of abdomen/pelvis. The study was conducted between August 2014 and February 2016 in a tertiary care hospital. All the patients were staged preoperatively by CT of abdomen/pelvis. All operable and borderline operable cases on CT, with no radiological evidence of metastasis and patients fit for neo-adjuvant chemotherapy was included in the study. Whereas patients with metastatic disease and patients not fit for general anaesthesia were excluded from the study.

Any area of gastric wall with thickness measuring more than 5 mm was considered abnormal. Irregularities in the external surface of wall were considered serosal involvement. Tumors confined to the gastric wall or intramural or transmural involvement with a smooth outer wall and clear fat plane around tumor were considered T1/T2. Transmural tumors with irregular or blurred outer border with or without perigastric fat stranding were considered as T3. Obliteration of fat plane between gastric tumor and adjacent organ or direct invasion of adjacent organ was taken as T4. Any enlarged lymph node seen in the 16 anatomic sites as per the Japanese Research Society on Gastric Cancer classification was noted as nodal disease.^{3,4}

Diagnostic laparoscopy was done in all these patients before proceeding with a formal exploratory laparotomy.

Open technique was used to gain access into abdomen. A formal diagnostic laparoscopy was undertaken through a subumbilical port. Definitive surgery was performed on the patients who were found resectable on laparoscopy.

A formal staging of the patient was done as per the 7th edition of the UICC/TNM Classification, and a comparison between the staging obtained from CT and that from laparoscopy was made based on the final histopathology.⁵

The findings from CT and staging laparoscopy were compared with the final histopathological stage. Agreement between the perceived preoperative stage of gastric cancer as determined by CT, laparoscopy, and the final stage was determined using the weighted Kappa statistic (Kw). The value of Kappa has a maximum of 1.00 when agreement is perfect, a value of zero indicates no agreement better than chance, and negative values show worse than chance agreement. We tested the hypothesis Kw=0 and assessed the value of Kw for strength of agreement according to the guidelines of Landis and Koch (a value between zero and 0.2 is defined as being poor agreement, between 0.2 and 0.4 is termed fair agreement, 0.4 to 0.6 moderate, 0.6 to 0.8 good, and 0.8 to 1 is very good agreement).

The sensitivity and specificity, positive predictive value (PPV), and negative predictive value (NPV) were also calculated. Data analysis was carried out with the Statistical Package for Social Sciences (SPSS).

RESULTS

The mean age of presentation was 52.17±10.7 years. 12 patients were female and 18 patients were male.

Accuracy of staging of tumor infiltration (T stage)

Table 1: Accuracy of CT in T staging.

		Histopathology		
		T2	T3	T4
CT	T2	1	3	0
	T3	1	3	4
	T4	0	1	5

Table 2: Accuracy of staging laparoscopy in T staging.

		Histopathology		
		T2	T3	T4
Staging laparoscopy	T2	2	1	0
	T3	2	5	1
	T4	0	0	7

By statistical analysis, the strengths of agreement between the perceived T stage on CT and the final histopathological stage were fair (Kw 0.314; 95% confidence interval [CI], 0.03 to 0.66; P >0.001) for CT,

compared with good (Kw 0.668; 95% CI, 0.39 to 0.98; P >0.001) for laparoscopy.

Accuracy of staging of distant metastases (M stage)

Table 3: Accuracy of CT in M staging (peritoneal deposits / <5mm-1cm liver deposits).

		Histopathology	
		M0	M1
CT	M0	18	12
	M1	0	0

Table 4: Accuracy of laproscopic staging in M staging (peritoneal deposits/<5mm-1cm liver deposits).

		Histopathology	
		M0	M1
Staging laparoscopy	M0	18	0
	M1	0	12

The strengths of agreement between the perceived M stage and the final histopathological stage were poor (Kw 0.0; 95% CI, 0.0 to 0.00) for CT, compared with perfect (Kw 1.00; 95% CI, 1.00 to 1.00;) for laparoscopy.

12 (40%) patients were found to have distant metastases on laparoscopy that were undetected by CT (7 peritoneum alone, 1 liver alone, 4 liver and peritoneum). The metastasis was in the form of granular peritoneal deposits or subcapsular (<5mm- 1cm) liver deposits.

Table 5: Sensitivity, specificity, predictive values and accuracy of CT in T staging.

CT	Sens.	Spec.	PPV	NPV	Acc.
T2	66	86	50	92	74
T3	68	78	66	78	70
T4	70	88	83	78	74

Table 6: Sensitivity, specificity, predictive values and accuracy of staging laparoscopy in T staging.

Staging laparoscopy	Sens.	Spec.	PPV	NPV	Acc.
T2	68	86	66	92	78
T3	76	75	77	81	79
T4	87	96	97	70	90

In 15 (50%) patients the disease was upstaged by laparoscopy compared to CT (12 requiring palliative chemotherapy/palliative draining procedures, remaining 3 underwent neo-adjuvant therapies).

Of the 12 patients with missed metastatic disease on CT, 4 patients were staged as T2/3N1/2M0 and 8 patients were staged as T4a/bN1/2 on CT. The most common T

stage on CT scan was T3 44.4%. The overall accuracy of CECT for T staging was 72% with sensitivity of 68% and specificity of 84%. The most common T stage on laparoscopy was T4 44.4%, the overall accuracy of T staging on laparoscopy was 81% with sensitivity of 77% and specificity of 85% (Table 5, Table 6).

DISCUSSION

In our study 30 patients underwent a diagnostic laparoscopy after a preoperative CECT excluded any form of metastasis. At diagnostic laparoscopy, 12/50 patients revealed metastasis. Thus an unnecessary laparotomy was averted in 12 (40%) patients. Similar observations were made by Lowy et al (23%), Conlon (33.7%), Sotiropoulos et al (31.1%), and Burke et al (37%).⁶⁻⁹ The magnification afforded by laparoscopy makes it possible to even pick up small peritoneal nodules which are otherwise missed on imaging modalities.

Routine staging laparoscopy is now advocated following CT and endoluminal ultrasound prior to consideration of radical surgery in patients with gastric cancer.¹⁰⁻¹³ Staging laparoscopy is recommended to confirm the absence of peritoneal metastasis prior to surgery in patients with advanced gastric cancers.¹⁴⁻¹⁶

The principal findings of this study were that both CT and laparoscopy agreed significantly with histopathological T stages, CT correctly staged 9/18 (50%) patients, under-staged 7 (38.8%) and over staged 2 (11.1%). CT had a sensitivity of 68% and a specificity of 84% for T staging. Diagnostic laparoscopy correctly staged the T status in 14 (77.78%) patients and it overstaged 2 (11.11%) patients, and understaged 2 patients (11.1%). Diagnostic laparoscopy had a sensitivity of 77% and a specificity of 85% for T staging. Overall accuracy for T stage with laparoscopy was 82% as against 72% of CECT (P = 0.0324). Our results are similar to those of the study conducted by Blackshaw et al. and D’Ugo et al.¹⁷

Laparoscopy held a small advantage over CT in assessing T stage, and a statistically significant advantage over CT in assessing the presence of peritoneal metastases and liver metastasis. The striking feature of the major published reports regarding the value of laparoscopy in staging patients with gastric cancer is the extreme variability of the results. Most of the data have emerged from centres with a high incidence of advanced gastric cancer.

In Japan, where more than 60% of the gastric cancers diagnosed are early tumors, staging laparoscopy remains very rare. By contrast, advanced disease precluding curative surgical resection undetected by preoperative CT has been described in 2%–37% of patients in the western population.^{18,19} The clinical benefit of diagnostic laparoscopy in this study was that 12 patients were found

to have distant metastases on laparoscopy that were undetected on CT, and were saved unnecessary laparotomies. The information provided by staging laparoscopy in our patients changed the initial therapeutic plan in 15 (50%) of the 30 patients, with 12 patients requiring palliative intent treatment and 3 patients taken up for neoadjuvant treatment.

This study has some limitations. Staging laparoscopy has shortcomings compared to CT and EUS. For example, lymph node metastasis is not easily detected by laparoscopy. More recently, laparoscopic ultrasound examination in addition to CT and laparoscopy has been championed by some authors, as a further beneficial staging modality.²⁰

CONCLUSION

Laparoscopy is a valuable technique in staging stomach carcinoma and has an important role in the detection of occult extensive intra-abdominal metastatic disease not detected by conventional radiological staging. Optimal preoperative staging of gastric cancer, using CT followed by laparoscopy, selects patients for whom radical surgery can be potentially curative.

It is apparent that the judicious use of laparoscopy can improve the preoperative stage of gastric cancer when compared with CT alone. Until the sensitivity and specificity of radiological imaging approaches 100%, laparoscopy will continue to provide important additional staging information and improve treatment decision making in Gastric cancers.

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