

## Immediately preoperative laparoscopic staging for gastric cancer

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### Abstract

**Background:** This ongoing study is a prospective evaluation of immediately preoperative video-laparoscopy compared to ultrasound/computed tomography (US/CT) staging for gastric cancer. An analysis of the first 70 cases is reported.

**Methods:** TNM staging is used to compare the US/CT findings and the laparoscopic findings with the gold standard for pathologic findings in resected specimens.

**Results:** In our series 47 out of 70 cases are locally advanced cancers (stages III and IV): In this subset the predictive value of laparoscopic staging is 86.4%. Laparoscopy shows an overall staging accuracy of 68.6%, compared to 32.8% for US/CT. The difference is statistically significant as regards the T factor (T3: 69.7% vs 12.1%,  $p < 0.002$ ; T4: 84.2% vs 42.1%,  $p < 0.05$ ); as regards the M factor, laparoscopy appears the most specific method for detecting peritoneal seeding.

**Conclusions:** This procedure plays a crucial role in determining the resectability of the tumor, thus avoiding unnecessary laparotomies. A meticulous staging becomes mandatory when applying modern treatment options (e.g., neoadjuvant chemotherapy) to locally advanced cancers; in this context the use of staging laparoscopy will have a relevant impact on future treatment.

**Key words:** Laparoscopy — Gastric cancer staging — Resectability

Although a number of studies over the last two decades have evaluated the potential of laparoscopy to assess intra-abdominal malignancies [10, 15], the practice of diagnostic laparoscopy in the preoperative workup of patients with gastric cancer has yet to gain widespread acceptance [14], even since the advent of the CCD endocamera. To date there

is no definite evidence from prospective studies about the utility of laparoscopy compared to ultrasound scan (US) and computed tomography (CT) in staging gastric carcinoma; on the other hand, the clinical role of US and CT for diagnosis of gastric cancer has been questioned because of their low accuracy in clinical staging: The high false-negative rate for CT has been confirmed by recent prospective studies and it has been pointed out by many [2, 12] that negative US or CT scans do not entirely exclude the possibility of liver or peritoneal malignancy. In contrast to conventional imaging techniques laparoscopy may provide a direct and detailed intra-abdominal view: According to historical series, even before the introduction of video-endoscopy laparoscopy was an impeccable test for detecting tumor fixation, peritoneal dissemination, and unexpected liver metastases [15].

There is also recently published evidence that staging laparoscopy may substantially reduce the need for exploratory laparotomies in patients with carcinoma of the stomach [12], but there is not sufficient data on the routine use of staging laparoscopy performed immediately before resective surgery.

Based upon such considerations, we started a prospective evaluation of video-laparoscopy compared to US/CT conventional staging for gastric cancer.

### Materials and methods

The research design requires the enrollment of 100 consecutive patients over an 18-month period, starting in April 1995; at the time of the presentation of this paper, in March 1996, the data of the first 70 cases have been preliminarily analyzed.

In this study we proceed to an immediately preoperative laparoscopy in patients with proven adenocarcinoma of the stomach, after a complete diagnostic workup (upper-G.I. X-ray, endoscopy, liver US, and abdominal CT). Patients with obviously unresectable lesions (e.g., evidence of liver metastases by US or CT scanning, neoplastic ascites, pelvic dissemination of tumor, extra-abdominal lymphadenopathy) are excluded from the protocol.

Laparoscopy is performed under general anesthesia immediately before the laparotomic exploration. A Hasson trocar is inserted below the umbilicus in order to obtain a wider view of the entire supramesocolic area. A 30° scope is used in most cases.

Laparoscopic staging must be conducted following an "inverted TNM mode" (this means evaluating the M factor first, followed by the N and T

**Table 1.** TNM staging sensitivity

Stage	Verified by pathology	US/CT	Laparoscopy	<i>p</i>
Overall	70 (100%)	32.8% (23/70)	68.6% (48/70)	<0.002
III	23 (32.8%)	21.7% (5/23)	47.8% (11/23)	NS (*)
IV	24 (34.3%)	25% (6/24)	87.5% (21/24)	<0.002

\* Not statistically significant

**Table 2.** T stage sensitivity

Stage	Verified by pathology	US/CT	Laparoscopy	<i>p</i>
Overall	70 (100%)	41.4% (29/70)	80.0% (56/70)	<0.002
T3	33 (47.1%)	12.1% (4/33)	69.7% (23/33)	<0.002
T4	19 (27.1%)	42.1% (8/19)	84.2% (16/19)	<0.05

factors). The parietal and visceral serosal surfaces of the peritoneum are inspected initially for malignant implants. It is appropriate to look carefully for evidence of ascitic fluid, the cytological examination of which should be an integral part of the procedure. Placing the table in a Trendelenburg position facilitates the examination of the pelvic cavity; in female patients the ovaries must be visualized in order to exclude Krukenberg metastases. The visible surfaces of omentum, diaphragm, and liver are then inspected; a palpating probe is inserted through a second 5-mm port at the left of the midline in order to obtain a minimal manipulation of the left liver lobe and the small bowel. Tilting the table facilitates the approach to the area of the stomach that is covered by the left liver lobe; before determining the extent of tumor infiltration on the gastric wall, the perigastric nodes are inspected along the greater and the lesser curvature, on the gastrohepatic ligament and at the hepatic hilum.

Most of the anterior wall of the stomach can be inspected without manipulation; supplementary trocars and instruments were not used in the first 35 cases of the present study, but relatively soon it became evident that they allow a more accurate evaluation of the degree of posterior tumor extension. The position for the placement of the third trocar is dictated as the anatomy becomes evident during the laparoscopic examination. When the tumor originates from the posterior wall or a posterior fixity is suspected, one of the probes may be thoroughly inserted behind the stomach, through an avascular area of the greater omentum; especially in thin patients the posterior tumor mass may be lifted to test its mobility.

In our experience the average time for this laparoscopic staging has been 14 min. In keeping with the study protocol, staging laparoscopy was always immediately followed by exploratory laparotomy.

## Results

The TNM classification staging was used to compare the preoperative imaging findings (US and CT) and the diagnostic laparoscopy findings with the gold standards of macroscopic exploration and pathologic examination of surgically resected specimens.

The sensitivity of the two diagnostic procedures was measured and the agreement with the gold standard was statistically verified by the Cohen test.

The TNM staging sensitivity of preoperative laparoscopy, compared to US/CT, is summarized in Table 1: Laparoscopy shows an overall staging accuracy of 68.6%, compared to 32.8% for US/CT; differences are more marked as regards locally advanced tumors: in this subset the predictive value of laparoscopic staging is 86.4%. Table 2 shows the sensitivity of laparoscopic staging compared to US/CT conventional staging as regards the evaluation of the T fac-

**Table 3.** Laparoscopic T staging false results "regression table"

T Factor	Histopathology		
	≤ T2 (18)	T3 (33)	T4 (19)
Laparoscopy			
≤T2 (25)	17	7	1
T3 (26)	1	23	2
T4 (19)	–	3	16
False results	1/18	10/33	3/19

**Table 4.** Overall N staging sensitivity

	Agreement with the gold standard	K (Cohen test)
US/CT	54.29%	0.325
Laparoscopy	65.71%	0.489
<i>p</i>	NS(*)	

\* Not statistically significant

tor alone; laparoscopy correctly evaluated 23 out of 33 T3 cases, with a specific sensitivity of 69.7% vs 12.1% ( $p < 0.002$ ), and 16 out of 19 T4 cases with a specific sensitivity of 84.2% vs 42.1% ( $p < 0.05$ ). Table 3 shows the dispersion of the false results concerning T2, T3, and T4 tumors: Most of the false results belong to the T3 group. These can be explained by the operator's interpretation by subtle alterations in the gastric serosa over the tumor, which pathology showed had not been infiltrated. As regards T4, the false-negative results are mainly due to posterior extension of the tumor; the degree of posterior fixity of a tumor, the presence of adhesions in the lesser sac, and infiltration in the pyloric area are in any case difficult to assess, and we believe that especially in obese patients these must be considered among the major limitations of the technique [1, 12].

Overall N-staging sensitivity is reported in Table 4: In this subset laparoscopy failed to show a statistically significant difference from conventional staging.

As regards the M factor, all patients in the study were clinically staged as M0 before laparoscopy; laparoscopy detected 18 M1 cases out of 70, with no false positives and no false negatives compared to the gold standard. This indicates preoperative laparoscopy as the most specific method for detecting peritoneal dissemination of the tumor.

Laparoscopy was successfully performed without complications in all patients.

As regards possible delayed sequelae of the procedure, a theoretical concern is seeding of the abdominal wall or trocar site with tumor. In the world literature one case of early implant on a trocar site has been reported [3]. In our entire experience of diagnostic laparoscopy in surgical oncology, we have observed such an event in just one patient with gallbladder cancer, but never in cases of gastric cancer.

## Discussion

Although gastric cancer is declining in incidence, it still remains the fourth-most-common malignant tumor in Italy, where it is responsible for 17.1/100,000 deaths in the male population.

Until recently, our policy in the management of patients with carcinoma of the stomach has been to reset for cure and palliation whenever possible. However, a review of the western series shows that 15.8% to 34.3% of patients who undergo exploratory laparotomy present with such advanced disease that resection, whether curative or palliative, is not feasible. It is a common observation that exploratory laparotomy for confirmation of irresectability leads to unnecessary expense, stress, and morbidity: Complications do occur in 12–23% of unresectable patients, with a reported mortality ranging from 10% to 21.1% [19]; patients who are not offered surgery actually have a longer mean survival than those who have exploratory laparotomy or bypass [19]. Moreover, in some series [7] the 5-year survival rate of patients who undergo “curative” resections does not differ significantly from the 5-year survival of patients who receive surgical palliations. Most of these disheartening features are due to understaging [9]. Therefore, a more accurate preoperative staging is needed and in this context we thought that a wider use of laparoscopy could be of help [5].

It is a common opinion that staging laparoscopy is underutilized in many areas of surgical oncology [13, 16, 17], even though over the last two decades many reports have stressed the potential role of this procedure in treating a variety of gastrointestinal tumors.

In a series of 360 gastric cancer patients who underwent laparoscopy over a 10-year period beginning in 1974 (before the introduction of endocameras), Possik reported a sensitivity of 83% in the detection of peritoneal metastases and 87% in the detection of liver metastases [15].

More recently, Kriplani and Kaipur performed preoperative staging laparoscopy as a separate procedure in a series of 40 patients who were considered resectable after US and CT workup. Laparoscopy showed the presence of unsuspected M1 disease in 11.5% and unresectable T4 cancer in 27.5% of patients [12].

However, prospective efficacy studies in which pathological examination represents the ultimate standard for staging have not been carried out to date [18].

In our study laparoscopy has shown an overall staging accuracy of 68.6%, compared to 32.8% for US/CT. The difference is more marked as regards the T factor; it is significant for T3 (69.7% vs 12.1%) and T4 cases (84.2% vs 42.1%). As regards the M factor our data confirm laparoscopy as the most specific method for detecting peritoneal carcinomatosis. In our series 47 out of 70 cases were locally advanced cancers (stages III and IV): In this subset the predictive value of laparoscopic staging is 86.4%.

Our study agrees with the above-mentioned rates of accuracy and sensitivity, as far as T and M staging are concerned: since features that may denote unresectability are especially linked to the understaging of the T4 and M1 cases (local tumor extension to posterior abdominal wall structures or to the gastrohepatic ligament and the diaphragm; spread to the mesocolon and colon; direct and metastatic spread to the liver; widespread peritoneal dissemination with or without ascites), a major impact of this approach will certainly be to reduce the number of “open and closed” laparotomies; this is of particular value in the poor-operative-risk patient. Although it might be concluded that a fairly accurate assessment of gastric carcinoma can be made by laparoscopy in a majority of patients, laparoscopy

alone does not give any information on the celiac nodes; moreover, N1 stations are also frequently underestimated.

As far as N staging is concerned, this technique has a number of drawbacks, but it has been reported that the sensitivity of laparoscopy in assessing nodal involvement in patients with esophageal and gastric cancer is approximately twice that of conventional US or CT [20]. According to a wide retrospective evaluation, CT is unreliable in the demonstration of local node involvement [11]. The new generation of CT scanners may increase the accuracy in detecting lymph node metastases, but many investigators remain unenthusiastic about the accuracy of CT in staging stomach cancer.

With regard to ultrasound scanning, the development of newer techniques is modifying the conventional preoperative approach to gastric cancer. On one hand, endoscopic ultrasonography has been described as the most accurate technique for the depth of infiltration in subserosal tumors and the presence of perivisceral nodes [4]. On the other hand, since the principal limitation of diagnostic laparoscopy is the inability to palpate organs or areas that are “covered” by other tissues, its staging potential could be enhanced by the introduction of laparoscopic ultrasonography [8]. In expert hands, laparoscopic ultrasonography could represent an alternative to palpation and become part of laparoscopic staging [6], provided surgeons become fully trained in the interpretation of this complex imaging technique.

## Conclusions

Laparoscopy is a relatively simple, well-tolerated, and safe procedure. Our data support the belief that laparoscopy is a valuable technique in the staging of gastric cancer and confirm its important role in the detection of unexpected extensive intra-abdominal disease compared to conventional preoperative staging [14].

This prospective study confirms the experience of others concerning the value of laparoscopy in the prevention of unnecessary surgical exploration in patients with locally advanced or metastatic disease [12, 15].

It may be foreseen that in the near future the avoidance of unhelpful laparotomies will not represent the only goal of diagnostic laparoscopy; neoadjuvant chemotherapy protocols can be accurately established by an accurate preoperative staging, and currently we are starting a trial of neoadjuvant chemotherapy for patients with T3, T4, or any N-stage tumors on the basis of immediately preoperative laparoscopic staging. In this context the application of “second look” laparoscopy offers the unique possibility of verifying the possible sites of residual disease after induction therapy.

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## Discussion

*Dr. Dunn:* I do agree with your results, but had you considered incorporating ultrasound in your staging? This might help you with node identification. You can identify them and actually get a biopsy.

The other question is: Have you used endoscopic ultrasound for preoperative staging? In many cases, you will be able to pick up nodes and perform ultrasound-guided node biopsies.

*Dr. D'Ugo:* These are very good points.

Endoscopic ultrasound has been demonstrated by a number of studies from Japan, and also from Sloan-Kettering.

It is the most accurate technique for determining the

depth of infiltration of the tumor. So it is surely the best method for detecting subserosal tumors. Regional nodes are also best detected by this technique.

As for laparoscopic ultrasound, this has been demonstrated during this congress to be an invaluable technique. And I am sure that in the future—and assuming that some of our economic problems also will be solved—it will become an integral process in laparoscopic staging.

*Dr. Bessler:* What percentage of the patients who are inoperable for cure, do you perform a palliative procedure. In other words, what type of patients would you not operate on for palliations?

*Dr. D'Ugo:* By the design of the study staging laparoscopy had to be followed by an exploratory laparotomy confirm the laparoscopy results using the gold standard of pathological examination of the specimen.

These days, we are changing our protocol. We now stop when we see T3 or T4 tumors; we don't open the patients any more.

*Dr. Bessler:* What about palliative procedures?

How many of the patients who are not resectable for cure are having a palliative operation at laparotomy?

*Dr. D'Ugo:* You mean what is the percentage of palliating for noncurable class?

*Dr. Bessler:* Right. Those patients who were not acceptable for cure.

*Dr. D'Ugo:* No. Until now, the policy of our unit has always been to resect as many patients as we can; both for the palliation and/or for cure.

But now, since the first results of chemotherapy are coming out, we believe that it is quite acceptable to stop.

*Dr. Kox:* You have gone to extremes comparing laparoscopy, and then checking by laparotomy; what are the crucial points when performing this laparoscopic exploration?

*Dr. D'Ugo:* The crucial points, in my opinion, are to do a very thorough exploration of the tumor itself; of the T-factor. This technique is very simple for detecting metastases. However, we have seen that the nodes are not accurately evaluated anyway.

But what we should avoid for the future are the false results in the evaluation of the T. I mean, you should not miss T-3 tumors or T-4 tumors; because until now, even with endoscopic ultrasound, these lesions just cannot be detected that well.

*Dr. Jorgensen:* So do you recommend some sort of gastric mobilisation to explore all of the different aspects of the stomach, and to get access to the lesser sac?

*Dr. D'Ugo:* Exactly. It is necessary to enter the lesser gastric cavity to explore the posterior aspect of the stomach wall.