Staging laparoscopy for gastric cancer

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Abstract

The growing role of multimodal treatment plans for advanced gastric cancer has contributed to the development of more accurate preoperative staging strategies. The high diagnostic efficacy of video-laparoscopy as regards the M factor has been reported by many; preoperative laparoscopy therefore permits to avoid unhelpful surgical exploration in case of peritoneal dissemination of tumor or liver metastases undetected by conventional staging. At Memorial Sloan Kattering Cancer Center preoperative staging laparoscopy is currently included in the diagnostic algorithm for gastric cancer. Data from a consecutive series of 103 patients demonstrated metastatic disease in 24 patients (37%) who were considered to have localized cancer by computed tomography (CT) or endoscopic ultrasonography (EUS), with an accuracy of 94% with respect to the M factor. These patients did not require open surgery.

Laparoscopic washings were obtained from 127 patients with gastric cancer and a positive correlation between the extent of disease and prevalence of positive cytology was noted (T1/T2: 0%, T3/T4: 10%, M+: 59%).

Our experience suggests that laparoscopy has added value in staging patients with gastric carcinoma. It appears to be a safe and effective staging modality, avoiding unnecessary explorations and providing new means of directing appropriate tretament strategy.

Key words: gastric cancer, preoperative staging, video-laparoscopy.

Riassunto

STADIAZIONE LAPAROSCOPICA NEL CARCINOMA GASTRICO

Il ruolo crescente di programmi multimodali nel trattamento delle neoplasie gastriche in stadio avanzato ha contribuito allo sviluppo di una sempre più accurata stadiazione preoperatoria. L'accuratezza diagnostica della video-laparoscopia riguardo al parametro M è stata documentata da molti autori; la laparoscopia preoperatoria permette, pertanto, di evitare inutili laparotomie esplorative in caso di dissemi - nazione neoplastica peritoneale o di metastati epatiche non evidenziate con la stadiazione convenzionale. Al Memorial Sloan Kattering Cancer Center l'impiego della laparoscopia

Introduction

For diseases such as Gastric Cancer, a pre-operative staging modality should be defined in terms of its ability to accurately define the extent of the tumor, direct appropriate therapy, and avoid unnecessary surgical intervention in a cost-efficient manner.

The importance of accurate pre-operative staging for gastric adenocarcinoma has increased in recent years as multidisciplinary management has evolved (1). No longer is a diagnosis of gastric cancer synonymous with the need for surgical exploration and a gastrectomy. It is now generally accepted that in patients without obstruction, hemorrhage, or perforation that the performance of a palliative gastric resection in which residual intraperitoneal disease remains, does not improve survival over that observed in unresected patients (2, 3). In addition, the introduction of neoadjuvant strategies for patients with locally advanced disease has provided a further motive for developing accurate pre-operative staging. Preliminary data has suggested that, in comparison to post-operative treatment, pre-operative chemotherapy is associated with an increased rate of tumor response, resulting in an increase in resectability rate and possibly in overall survival (4).

The modalities used in staging the patient with gastric cancer are listed in Table I. Endoscopy is the diagnostic method of choice for patients suspected to have a gastric adenocarcinoma, as it allows visualization of the tumor, determination of its location and performance of tissue biopsies. However, in most cases, endoscopy alone does not suffice as a staging modality. Endoscopic ultrasono-

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diagnostica è correntemente inserita nell'algoritmo diagnostico del carcinoma gastrico. L'analisi di una serie consecutiva di 103 pazienti ha mostrato la presenza di malattia metastatica in 24 pazienti (37%) giudicati portatori di una neoplasia a sviluppo locale mediante la tomografia computerizzata (TC) o l'ecoendoscopia (EUS), con una accuratezza del 94% nei confronti del fattore M. In questo gruppo di pazienti non è stato ritenuto necessario alcun trattamento chirurgico. Il lavaggio peritoneale è stato effettuato in 127 pazienti con carcinoma gastrico ed è stata riscontrata una correlazione positiva tra l'estensione della malattia e la positività citologica (T1/T2: 0%; T3/T4: 10%; M+: 59%).

La nostra esperienza suggerisce che la laparoscopia rappresenta oggi un fattore di miglioramento nella stadiazione dei pazienti con carcinoma gastrico. È una metodica sicura ed efficace, in grado di evitare inutili laparotomie e di effettuare scelte di trattamento più appropriate.

Parola chiave: carcinoma gastrico, stadiazione preoperatoria, Video-laparoscopia.

Tab. I. - DIAGNOSTIC MODALITIES

History and Physical Examination
Chest X-Ray
Endoscopy
Endoscopic Ultrasound
Upper Gastrointestinal Contrast Studies
Computed Tomography (Chest, Abdomen, Pelvis)
Magnetic Resonance Imaging
Laparoscopy
Laparoscopic Ultrasound

graphy (EUS) has improved the loco-regional staging of gastric cancer by virtue of its ability to image the gastric wall, and detect abnormal peri-gastric lymph nodes (5). However, EUS remains expensive and user dependant and is thus not widely available. For the majority of patients, dynamic, contrast-enhanced, helical CT scanning is the most commonly utilized radiological investigation for pre-therapeutic staging. However, following CT scanning, up to one third of patients are found to have been under-staged at laparotomy. Recent reports have shown that for upper gastrointestinal malignancies, laparoscopy can detect intra abdominal disease not apparent following standard radiological screening (6 - 10). The pre-operative diagnosis of occult intra-abdominal metastatic disease has significant implication for therapy and quality-of-life decisions. As mentioned above, it is our belief that in the absence of bleeding, and/or obstruction, the patient with stage IV disease need not be resected. Pre-operative identification of peritoneal or intra-abdominal metastatic disease avoids unnecessary operation in this group of patients. Additionally, our bias is that patients with locally advanced disease are at increased risk for local failure and should be considered for neo-adjuvant investigational trials. As a result, we believe that laparoscopy is indicated for the majority of nonobstructed, nonbleeding patients with gastric cancer. The risk of disseminated disease is low for those with "early" (T1 or T2) tumors, and these patients should proceed to laparotomy.

Patients with biopsy proven gastric adenocarcinoma are assessed with upper gastrointestinal endoscopy and a spiral CT of the chest, abdomen and pelvis.

Endoscopic ultrasonography (EUS) is not performed in every case, however, many patient undergo this examination at the discretion of the treating physician. If medically fit, patients with early disease (T1/2) undergo surgical resection. Those with obstructing or bleeding tumors require open operation and the remainder undergo laparoscopic staging. Patients with (T3/T4) or any (N1) disease are considered for pre-operative neoadjuvant chemotherapy and subsequent surgical resection. Patients with metastatic disease (M1) are offered enrolment in trials of investigational chemotherapy. A subset that have a good treatment response and on subsequent non-invasive imaging studies have no evidence of metastatic disease will be re-laparoscoped and considered for surgical resection.

Surgical technique

At Memorial Sloan-Kettering Cancer Center, laparoscopic staging is generally performed under general anesthesia. In many cases this is performed immediately prior to a planned open operation. For others an ambulatory setting is utilized. In the operating room, the patient is placed supine on the operating table. Access to the abdominal cavity is provided by means of an open cut-down technique, usually performed peri-umbilically. The Verres needle technique is not used due to concern relating to vascular or visceral perforation. We prefer to use a 30-degree angled telescope to examine the peritoneal cavity. A 5 mm trocar is placed into the left upper quadrant. If peritoneal or hepatic metastases are noted

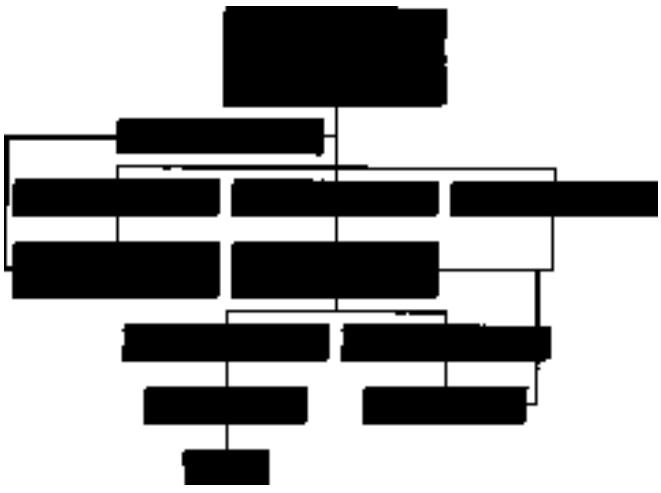

Fig. 1: illustrates the current management algorithm used at Memorial Hospital.

they can be easily biopsied throngh this port. Upper abdominal adhesions if present are divided. In the absence of metastatic disease a further 10mm port is generally inserted into the right-upper quadrant. The peritoneum, diaphragm, omentum, bowel, mesentry, liver and pelvic organs are systematically examined. Before manipulation of the primary tumor, peritoneal lavage washings are obtained from the upper abdomen and pelvis after the instillation of normal saline. Regional nodal groups are inspected. As it is our current practice to perforrn an extended lymphadenectomy in "curative" gastric resections, we do not routinely biopsy enlarged or suspicious peri-gastric nodes identified during laparoscopic staging.

Laparoscopic ultrasonography is used in selected cases to assess the primary tumor. A flexible laparoscopic ultrasound probe (Aloka) is inserted through the 10mm port. The high frequency transducer is placed directly on the gastric wall and the stomach is scanned from the gastro-esophageal junction to the duodenum. In order to compensate for the near-field loss, we distend the stomach with 800ml of warmed normal and scan the anterior wall by placing the probe postero-laterally. The layers of the gastric wall can clearly be seen. Five layers can generally be identified; (i) interface between lumen and mucosa, (ii) mucosa, (iii) submucosa, (iv) muscularis propria and (v) interface between serosa and surrounding tissue. Attention is paid to the depth of invasion of the primary tumor.

In addition, peri-gastric nodes are identified. Metastatic involvement is suggested if the node is greater than 10mm in diameter, appears inhomogeneous and has an irregular contour.

Results

For patients with gastric cancer, there have been no prospective randomized clinical trials, which have assessed the efficacy and impact of laparoscopic staging. However, a number of recent clinical studies have been reported which have helped to clarify its role.

Possik and associates evaluated laparoscopic staging in 360 patients with gastric cancer. They demonstrated a sensitivity of 87% for the detection of hepatic metastases and 83% for peritoneal dissemination (11). The ability to determine resectability was addressed by Gross and colleagues who found metastatic disease at laparoscopy in 27 of 46 cases (57%) (12). Eighteen patients were considered resectable and 16 (89%) subsequently underwent a gastrectomy. Kriplani and Kapur (13) reported similar results. In their series, laparoscopy documented distant metastases in 5 (13%) and locally advanceddisease in 11 (28%) cases. Resectability was correctly predicted in 87% of patients explored. Feussner and associates noted that laparoscopic staging altered the clinical stage in 47% of patients (14). In their group of 111 patients, 23% were found to have carcinomatosis undetected by conventional staging modalities.

D'Ugo and co-workers performed a prospective comparison of pre-operative laparoscopy with ultrasound and computed tomography (15). In locally advanced disease, the predictive value of laparoscopic staging was 86.4%. The overall accuracy of laparoscopic staging was 68.8% compared to 32.8% for US/CT. It appeared that the difference was statistically significant for those patients with locally advanced (T) or metastatic disease. Similar results were reported by Stell and colleagues, who noted in a consecutive series of 103 patients, that laparoscopic staging was more sensitive in detecting hepatic, nodal and peritoneal metastases than standard pre-operative imaging studies (16).

Lowy and colleagues from the MD Anderson Cancer Center reported a series of 71 patients with radiologically localized disease that underwent laparoscopy prior to operation (17). Successful laparoscopy was performed in 69 cases. Peritoneal metastatic disease was noted in 16 (23%) patients. An exploration was avoided in 12 of these patients. Overall in this series, the combination of CT plus laparoscopic staging resulted in a 93% resectability rate for patients operated on for curative intent. Similar results were reported by McCulloch et al., who noted that their treatment plan was altered in 34% of cases by the laparoscopic findings (18). In their series of 49 patients, peritoneal disease was identified in 11 patients (22%). Avoidance of unneccessary laparotomy was also reported by Asencio and co-workers (19). In contrast, van Dijkum and colleagues noted that laparoscopy only prevented explorative laparotomy in only 4 of 64 patients with esophageal or gastric cardia tumors (20). In their experience the overall efficacy of laparoscopy was a mere 6%.

Bonavina et al., also demonstrated the utility of laparoscopic staging in detecting peritonel carcinomatosis (21). They noted 5 true positives, 43 true negatives, and 2 false negative examinations in 50 patients with proximal gastric or distal esophageal cancer. In comparison, CT and US had a false negative rate of 12%. Small peritoneal lesions (< 10 mm in diameter) were difficult to image radiologically. Similarly O'Brien et al., found that laparoscopy defined 23 of 24 patients with peritoneal metastases in patients with proximal gastric or esophageal cancer (22).

In contrast to peritoneal carcinomatosis, nodal disease is considered by some to be difficult to assess laparoscopically. However, in their study Bonavina and colleagues demonstrated the potential of laparoscopy. Laparoscopy correctly defined 7 patients with celiac metastases and 41 patients without metastatic disease. There were no false positives and only a 4% false negative rate for laparoscopy. In comparison, spiral CT scanning had a 8% false negative rate and transabdominal ultrasound (US) a 16% false negative rate and each imaging modality had a 2% false positive rate.

Our recent experience is similar to others detailed above (23). In a consecutive series of 103 patients, laparoscopic staging demonstrated metastatic disease in 37% of patients who were considered to have localized gastric cancer by pre-operative CT or EUS. Laparoscopy accurately staged 94% of patients with respect to metastatic disease. A sensitivity of 84% and specificity of 100% was noted in this study. Compared to patients during the same time period that underwent an exploratory laparotomy only, post-operative hospital stay was significantly reduced (1.4 days versus 6.5 days). In addition, 24 patients had a laparoscopy alone, none of who subsequently required palliative surgery, supporting our contention that all patients do not require open surgery.
The added value, if any, for laparoscopic ultrasonography remains to be defined. Our preliminary experience suggests that the accuracy for determining T-stage is similar to EUS. Both modalities are less accurate in differentiating deep T2 from T3 lesions. One could argue that as both groups of patients are at higher risk for local recurrence and thereby are candidates for a neo-adjuvant approach, this "failure" is not clinically significant. Others have argued that the true benefit in gastric cancer is in detecting otherwise unsuspected hepatic metastases. Romijn et al., recently reported their expenence with laparoscopy and LUS in a series of patients with resectable esophageal and gastric cancer (24). In contrast to their experience with esophageal cancer, laparoscopy was an effective staging modality in the 20 patients with gastric cancer. At laparoscopic staging, 40% were noted to have distant metastases. LUS accounted for 50% of these cases, demonstrating it's utility in this patient population. Overall, laparoscopic staging with or without LUS identifies metastatic disease in approximately 25-40% patients with supposedly localized gastric cancer and results in resectability rates in excess of 90%.

Peritoneal cytology

We recently examined the therapeutic impact of peritoneal lavage cytology obtained at the time of laparoscopic staging (25). Laparoscopic washings were obtained from 127 consecutive patients with gastric cancer. A correlation between the extent of disease and prevalence of positive cytology was noted. No patient with early disease (T1/T2, M0) was noted to have positive cytology. In contrast, 10% of patients with T3/T4, M0 and 59% of patients with M1 disease were noted to have positive cytology. Significantly, even in the absence of visible metastatic disease patients with positive cytology had a prognosis identical to those with macroscopically obvious metastatic disease, indicating that positive lavage cytology indicates microscopic peritoneal metastatic disease. We believe that as these patients behave in a manner identical to patients with macroscopic peritoneal or hepatic metastases and that they should therefore be staged as M1.

Ribeiro and colleagues recently reported similar results in a study of 49 consecutive patients with gastric cancer who underwent laparoscopic staging (26). Lavage cytology was performed when ascites was absent. In the absence of macroscopic peritoneal carcinomatosis, positive cytology was noted in 29%. Positive cytology was correlated with the depth of invasion, histological subtype, advanced Borrmann class, and stage IV tumors. They suggested that cytology added sensitivity to the laparoscopic examination and may alter the therapeutic approach.

Conclusions

Experience to date suggests that laparoscopy has added value in the staging of patients with gastric adenocarcinoma. As a staging modality, it appears to be a safe, effective and cost-effective means of directing appropriate therapy and avoiding unnecessary exploration. Indeed it could be argued that the use of laparoscopic staging has resulted in the re-examination of traditional management paradigms for patients with advanced disease. We strongly believe that in the absence of complete obstruction or uncontrolled hemorrhage the traditional approaches to operative palliation may not be warranted with patients adequately palliated by non-operative means.
Whilst an increasing body of literature now exists regarding laparoscopic staging, further experience is required to define the long-term risks of the procedure, particularly in relation to dissemination of disease (i.e., port site implantation). In addition, the role and value of associated modalities such as laparoscopic ultrasonography remains to be clarified. Prospective studies currently ongoing will help answer these questions.

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