THE ROLE OF LAPAROSCOPY IN DISTAL GASTRIC CANCER

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Abstract

Since the first successful laparoscopic cholecystectomy, this type of approach has progressively extended its applications to gastric cancer. ***The aim*** *of our study is to review available data to determine the role of laparoscopy in gastric cancer.*

Results. *Laparoscopy was used as a preoperative staging tool or approach for the radical and palliative surgical procedures. Laparoscopy is superior to CT, when it comes to detect the gastric wall's serous invasion, namely the T3 stage. It has also been proven to be the most useful method of diagnosing some occult metastases. Applied routinely, prior to the resection that might become radical, it has allowed the pre-surgical staging to be corrected by 23,5% - 44%. The radical resections are possible through laparoscopic approach by observing the oncological principles with advantages of minimal invasion. The most frequent indications are represented by early gastric cancer and T2 for T3, the experience being limited. The laparoscopic approach also offers a negative impact, more reduced on the natural evolution of the neoplastic disease.*

Conclusions. *Laparoscopic approach has progressively expanded its indications to preoperative staging of gastric cancer, completing the data obtained by other diagnostic means, and to radical resections in both early and advanced stages, bringing the benefits of lesser invasion with faster postoperative recovery and less influence on the cancer's natural history, at the same time observing the oncological surgery principles.*

Keywords: laparoscopy, gastric cancer.

ROLUL LAPAROSCOPIEI ÎN CANCERUL GASTRIC DISTAL

Rezumat

De la primul succes al colecistectomiei laparoscopice, acest tip de abordare s-a extins progresiv cu aplicaţii şi în cancerul gastric. ***Scopul*** *studiului nostru este de a revizui datele disponibile pentru a determina rolul laparoscopiei în cancerul gastric.*

Rezultate. *Laparoscopia a fost utilizată ca un instrument de stadializare pre-operatorie sau ca abordare pentru dezvoltarea unor proceduri chirurgicale radicale şi paliative. Laparoscopia este superioară CT, când vine vorba de a detecta invazia peretelui gastric seros şi anume în stadiul T3. De asemenea, s-a dovedit a fi metoda cea mai utilă pentru diagnosticarea unor metastaze oculte. Aplicată în mod obişnuit, premergător la rezecţia care ar putea deveni radicală, le-a permis preoperator corectarea stadializării între 23,5% - 44%. Rezecţiile radicale sunt posibile prin abordare laparoscopică respectând principiile oncologice, cu avantajele invazive minime. Indicaţiile cele mai frecvente sunt reprezentate de cancerul gastric incipient, T2 şi T3, experienţa fiind limitată. Abordarea laparoscopică oferă, de asemenea, un impact negativ mai redus asupra evoluţiei naturale a bolii neoplazice.*

Concluzii. *Abordarea laparoscopică a extins progresiv indicaţiile sale pentru stadializarea preoperatorie de cancer gastric, în care completează datele obţinute prin alte mijloace de diagnostic şi rezecţiile radicale în etapele atât precoce, cât şi avansate, aducând beneficii de invazivitate mai mică, cu recuperare postoperatorie mai rapidă şi cu mai puţină influenţă asupra istoriei naturale a cancerului, dar cu respectarea principiilor de chirurgie oncologică.*

Cuvinte cheie: laparoscopie, cancer gastric.

INTRODUCTION

From the first video-laparoscopic cholecystectomy in 1987, which had a tremendous success, the field of application of this method has progressively extended, reaching the digestive tract neoplasm.

The distal gastric cancer (DGC) still presents an increased incidence and prevalence in developing countries. In the well developed countries of the Western world, the distal gastric cancer's incidence is continuously dropping [1].

The resection of the tumor within oncological limits with lymphadenectomy represents the center of the multimodal treatment for DGC, together with the neo-adjuvant chemotherapy and the adjuvant one combined with radiotherapy.

In many studies, laparoscopy has been used as a way of pre-surgical staging or as an approach to achieve some radical and palliative surgical procedures, a great amount of data being gathered in the literature in the last 15 years. Laparoscopy offers the advantage of minimal invasion by shortening the post-surgical rehabilitation, diminishing the incidence of early and late abdominal wall wound complications and also the post-operative immunosuppression.

The role of our study is to analyze the present data in order to establish the exact role of laparoscopy in the gastric cancer.

THE ROLE OF LAPAROSCOPY IN GASTRIC CANCER'S STAGING

Staging of gastric cancer is essential to establish the therapeutic indication and comparison of treatment's results.

The most exact pre-surgical staging reduces the number of useless laparotomies and permits the initial orientation towards other treatment methods. The staging is based on the TNM system, through which the tumor's invasion depth in the gastric wall and the nearby organs, ganglia extension, peritoneal, hepatic metastases and so on, is coded.

Computed tomography (CT-scan)

The most popular imaging method used in practice, is computer tomography, due to its accessibility and present performances. However, it is not a method of great performance. It has been proven that the sole use of CT most often leads to the disease sub-staging due to the fact that it cannot totally exclude the peritoneal and hepatic metastases [2].

The abdominal CT-scan presents a global precision of 43-82% in T appreciation, but it is not the most suitable for appreciating the lymphatic metastases [3]. This might be improved by the use in conjunction with PET (positron emission tomography) but its utility is more important in the post-surgical follow-up, for detecting of recurrences [4].

The CT-scan's capacity of detecting peritoneal metastases has been investigated in many studies that have reported a sensitivity between 25-26% [5,6,7,8,9]. In another study, the sensitivity, specificity and accuracy have been 18%, 99% and 76% for the abdominal ultrasound and CT [10].

Endoscopic ultrasonography

The endoscopic ultrasound or echo-endoscopy (EUS) can detect the parietal tumor penetration depth, can evaluate the lymph nodes positioned near the gastric wall and it also can highlight the presence of ascites.

The global accuracy of EUS in the correct appreciation of parietal tumor invasion is of 65-92%, and of ganglionar invasion is 50-95% [3]. In case of ganglionar invasion it might result in supra-staging, when there are focal inflammatory modifications in the lymphnode, but also a sub-staging, appreciating an invaded one as inflamed [11]. Another technical limitation arises from the difficulty of evaluating the lymphnodes located at distance from the gastric wall. The diagnostic precision can be improved by sampling the lymph node's cellular material, through fine needle aspiration biopsy for the cytological exam.

In a study by Repiso et al. [12] regarding the EUS role in gastric cancer's staging, the accuracy of appreciation T_1, T_2, T_3 and T_4 was of 100, 38, 82 and 100% respectively. The sensitivity and the differentiation of T_{1-2} of T_{3-4} tumors, the method specificity was of 94 and 85%. The authors could not identify the factors due to which this correct estimation of the T was so successful. In the same study, the N_0 stage was indicated with a precision of 58%, and globally, for the N invasion, the precision was of 88%. In cases in which the EUS highlighted a peri-gastric liquid, the surgical intervention has confirmed peritoneal carcinomatosis in 71.4% of them.

In a Lee et al. study [10], the sensitivity, specificity and accuracy of peritoneal metastases detection was of 73, 84 and 89% respectively. Also in this study, just like in the previous one, the ascites' EUS detection has been the sole independent peritoneal metastases factor of prediction.

The EUS has proven to be much superior to the abdominal ultrasonography and CT conjunction in diagnosing ascites, with only 16.1% against 87.1% (Lee et al. [10]).

In a meta-analysis made by Levine et al [13], the global accuracy of T and N staging for CT and EUS has been of 85% and 88%, respectively 70% and 90%.

Laparoscopy

Laparoscopy is superior to the CT, when it comes to detecting the gastric wall serous invasion, namely the T3 stage. In a study conducted by Mahadevan et al. [2], laparoscopy has detected the T tumors in proportion of 90.3%. The CT made a much weak detection.

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Sarela et al. [14] have conducted a study in which laparoscopy has been proven to be the most useful method of diagnosing occult metastases; applied on 657 cases of gastric cancer, it has identified 31% of metastasis cases that haven't been noticed in previous exploratory processes.

The peritoneal lavage and its cytological exam can detect the presence of neoplastic cells, providing more information regarding the disease's stage. Therefore, 6.5% of the patients with radical resections considered R0 (without any microscopic tumor residuum) have presented micro-metastases in the peritoneal lavage liquid, at the cytological exam [15]. In tumors pT1/T2 case, no neoplastic cells were found in the lavage liquid, and the prediction of this tumoral stage was achieved in proportion of 91%, through EUS [16]. The authors consider that in this situation, there is no need for a systematic peritoneal lavage with cytological exam.

In a study of Roviaro et al. [17], exploratory laparoscopy was made systematic, as a first step of the entire surgical intervention. This confirmed the pre-surgical staging in 74.6% of cases, in 17% has proven a supra-staging, and in 8.5% of cases has identified unsuspected causes of non-resectability.

In a study conducted by Nakagawa et al. [8], regarding the role of exploratory laparoscopy and peritoneal cytology in the gastric adenocarcinoma, 47% of cases were re-staged, 3% with an inferior stage, and 44% with a more advanced stage. In 22.6% of cases, occult peritoneal metastases were identified at the anterior paraclinical exams, and in 29% of cases neoplastic cells were identified in the peritoneal lavage.

In a study of Lehnert et al., 120 patients with primary gastric cancer confirmed histopathologically were evaluated prospectively and assessed by endoscopy, endoscopic ultra-sound, abdominal ultrasonography, abdominal CT or MRI for detection of metastases and local extension. From 81 patients selected for laparotomy with curative resection, this was possible only in 95% of cases. 2 cases (2.5%) presented localized peritoneal carcinomatosis that escaped preoperative detection and might have been detected by diagnostic laparoscopy. Diagnostic laparoscopy was performed in 15 patients in whom preoperative evaluation indicated T3/T4 tumor or was inconclusive for peritoneal or liver metastasis. In 6 patients (40%) diagnostic laparoscopy identified metastasis (peritoneal and/or liver), missed localized peritoneal carcinomatosis in 5 patients (33.33%) that was found later at laparotomy, and was accurate in 4 cases (26.66%) that were amenable for curative resection. [18].

Table I. Role of CT, EUS and laparoscopy in staging of gastric cancer.

	T	Positive lymphnodes	Peritoneal carcinomatosis
CT	48-32	w	76%
EUS	65-92%	50-95% FNA for citology	71-89%
Laparoscopy	90.3%	biopsy	Visual detection + biopsy

THE SENTINEL LYMPHNODE

The idea of sentinel lymphnode is based on the discovery of the ganglion towards which the tumor's lymphatic drain is made. The ulterior ganglionar dissection will be guided by the presence or the absence of metastases in this ganglion. In early gastric cancer there might be an interest to biopsy the sentinel ganglion, but in advanced forms the interest is reduced [19].

The patients with metastatic disease discovered through laparoscopy will be advised towards other methods of treatment. Less than 50% of them will be ulterior subjected to a palliative gastric resection, and less than 30% will need a surgical intervention that is purely palliative until death occurs [20].

The role of perioperative chemotherapy was addressed in the MAGIC study (Medical Research Council Adjuvant Gastric Infusional Chemotherapy) published by Cunningham et al [21]. The chemotherapy regimes meant the administration of 3 cycles of an epirubicin and cisplatin combination, before surgery. The surgical intervention started 3-6 weeks after the chemotherapy cycles, and 3 postoperative cycles of the same drugs were administered after a period of varying between 6-12 weeks. The monitoring period was 4 years and it was proved that the chemotherapy group of patients had a higher survival rate and surviving without recurrence.

THE ROLE OF LAPAROSCOPY IN GASTRIC RESECTIONS

Most of the studies comparing laparoscopic distal gastric resections with open surgery have proven the benefits of the minimal-invasion approach: less pain, faster recovery, less hospitalization time and a better quality of life for patients [22,23,24]. The laparoscopic approach in advanced gastric cancer remains a controversy, due to the technical difficulties encountered in perigastric lymphadenectomy, the possibility of metastases at the level of the trocar system, the insufficient data regarding the oncological quality of the intervention in patients with T_3 [25,26].

In a study by Kitano et al, 28 patients with distal early gastric cancer were randomly assigned (14/14) to open or laparoscopic distal Billroth I gastric resections. Comparative analysis revealed no difference between groups in terms of age, gender, height, weight, staging, and location of gastric cancer. Blood loss was significantly less in the laparoscopic group. Quality of the surgical oncologic resection was similar, but patients in the laparoscopic group had an earlier ambulation, less pain, and less impaired pulmonary function [27].

A similar study was performed by Mochiki et al, including patients with early gastric cancer submitted to both laparoscopic and open distal gastrectomy. Patients were matched for age, gender and histological differentiation of the lesion. Laparoscopic approach was significantly

longer. Authors manage to demonstrate, using digestive contrast a quicker recovery of the digestive tract motility in laparoscopic group. Number of harvested lymphnodes was smaller in laparoscopy. Postoperative complications, length of stay were less after laparoscopy [28].

In a study by Tanimura et al, including gastric cancers located in the middle of distal third of the stomach, no more advanced than T2N0 at preoperative staging including endoscopy, upper GI series, endoscopic ultrasound, CT-scan, that were assigned to laparoscopic or open distal gastric, the laparoscopic approach proved safe, with faster postoperative recovery and similar survival rate [29]. In studies that have been conducted on subjects with advanced local gastric cancer, the tumoral invasion was rather T_2, T_3 being rarely encountered [30,31].

Shuang et al. [32] conducted a study in which they compared the technical feasibility and the oncological efficiency of the laparoscopic assisted inferior polar gastrectomy with the open gastrectomy on advanced local distal gastric cancer. 60% of the patients included in the study have presented T_3 tumors. The authors recorded a longer surgical period of time for the laparoscopic approach, but less blood loss, a shorter hospitalization period, reduced post-surgical pain. They did not notice any difference between groups regarding the early and late post-surgical morbidity, the number of resection ganglions and the cumulated survival.

In 2005 Huscher et al. [33] published a randomized comparative prospective study in which they evaluated the feasibility, early and 5 years outcome of laparoscopic subtotal gastric resection compared to open for distal gastric cancers. Patients with metastatic tumor and extension beyond gastric wall were excluded; however 46.7 % of T_{3-4} cases were present in laparoscopic group and 58.6% in open group. Statistical analysis did not find any significant difference between the 2 groups concerning demographics, ASA status, pTNM stage, histologic type of the tumor, duration of surgery, type of gastrointestinal reconstruction, number of resected lymph nodes, and preoperative and postoperative hemoglobin. Estimated blood loss was significantly higher in the open group. There were similar postoperative morbidity and mortality. Laparoscopic group had earlier resumption of food intake and shorter hospitalisation. Both groups had similar survival rates, disease-free intervals and 5-year recurrence rates.

Despite the laparoscopic approach superiority in the inferior polar gastrectomy over the open approach, financially things are quite the opposite. In a cost-efficiency study, comparative with the conventional surgery, Hoya et al. [33] have noticed a lack of financial benefit for the hospital. This is due to the use of single-use equipment, in the authors' opinion.

Yu et al. [35] have conducted a study where they investigated the effects of interleukin 1b (beta) and tumoral necrosis factor TNF-a (alfa), over the interaction between gastric cancer cells and the mesothelial cells, and over the differences between peritoneal and systemic cytokines after both the laparoscopic and conventional approach. They ascertained that IL-1b abd TNF-a were factors that significantly stimulated the cellular adhesivity in gastric cancer, in laboratory conditions. This way, these factors can be partially considered responsible for the tumoral recurrence and the in vivo peritoneal metastases. The laparoscopic surgery influences less the local peritoneal and systemic immune response. This way, it determines not only advantages by clinical means, but also by means of natural history of the neoplastic disease, which is much less influenced than with open surgery.

CONCLUSIONS

The laparoscopic approach has extended its applications to the gastric cancer too. The exploratory laparoscopy practiced systematically in the advanced local gastric cancer, before a surgical intervention with radical intention, might complete the pre-surgical staging and might avoid a useless laparotomy intervention with its morbidity, orienting toward other adjuvant therapies. Its utility is much increased in case EUS is not available. The additional diagnosis is in detecting *the gastric wall's serous invasion and peritoneal metastases.*

Laparoscopic gastric resections are feasible, observing the oncological principles, and offer the patient the advantages of minimum invasion. In locally advanced tumors there is limited experience with T_3 tumors, additional studies are needed to validate the laparoscopic approach.

The laparoscopic approach, through a much reduced influence over the inflammation's mediators, which encourage peritoneal metastases and local recurrence, has a much reduced unfavorable impact on the disease's natural history, unlike open surgery.

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