

Technical pro & cons of the laparoscopic lymphadenectomy

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Abstract: Laparoscopy has been introduced in treatment of gastric cancer to reduce surgical trauma and to improve post-operative functional recovery. Most of international guidelines allow the use of this minimally invasive approach in general surgical practice only in clinical stage I. One of the most important concerns in fact is the feasibility of D2 lymphadenectomy through laparoscopy. Reduced numbers of harvested lymph nodes have been reported, particularly in stations with a more difficult access. Nevertheless subsequent papers reported adequate numbers of total number of nodes retrieved, even with D2 dissection and even in complex stations but results from randomized controlled trials still lack. Laparoscopic approach has been proven safe and effective also in extremely complex maneuvers as spleen-preserving retropancreatic lymphadenectomy. The minimally invasive approach in D2 lymphadenectomy seems to be associated to comparable incidence of specific complications as compared to open surgery. The use of laparoscopy has extended the operating time but has reduced the blood loss. Because of high complexity of this kind surgery, laparoscopic gastric surgery for cancer should be done only in referral centers.

Keywords: Gastric neoplasms; lymph node excision; laparoscopy

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Introduction

As in other fields of surgery, laparoscopy has been introduced in oncologic gastric surgery aiming to reduce the surgical trauma and allow a faster recovery of patients. In 1994 Kitano (1) first reported a laparoscopic gastric resection for early gastric cancer (EGC) and in 2001 Goh *et al.* (2) first published a laparoscopic assisted gastrectomy with a D2 lymphadenectomy for advanced gastric cancer (AGC).

Nowadays guidelines of the Japanese Gastric Cancer Association consider the laparoscopic approach an adequate treatment in general clinical practice only in stage I cancer in which a distal gastrectomy is indicated. Cases of AGC or those in whom a total gastrectomy is indicated, should be treated by a laparoscopic approach only in clinical trials and at high volume centers (3). Similar positions have been taken also in the West by the European Society of Medical

Oncology, European Society of Surgical Oncology and European Society of Radiotherapy and Oncology and in Italy by the Italian Research Group for Gastric Cancer (4,5).

Materials and methods

A Medline search for gastric neoplasms, lymph node excision, lymphadenectomy and laparoscopy was made. Case reports and small case-series were excluded.

Feasibility of an adequate D2 lymphadenectomy

One of the reasons for this limited area of application of laparoscopy is the concern about the feasibility of an adequate D2 lymphadenectomy. In fact by a technical point of view this is a very difficult and challenging procedure

even in experienced hands. For example Miura reported a statistically significant lower number of harvested lymph nodes after laparoscopic gastric resection than open approach. In particular, the stations mainly involved were the No. 4, 6, 9 and 11 (6). Subsequently, other studies evidenced how the total number of harvested lymph nodes after laparoscopic or open gastric resection was similar (7,8). Nevertheless the total number of harvested lymph nodes is a fast but suboptimal index of the extension and effectiveness of a lymphadenectomy, because the minimum number of 15 nodes could be obtained even in presence of incomplete nodal dissections in the more difficult stations. Interestingly other authors reported even better performances with laparoscopic approach: Huang *et al.* in a paper comparing 506 laparoscopic gastric resection with 428 open retrieved significantly more lymph nodes with the mini-invasive technique at the station No. 7 and 8 (9). The finding of a higher number of nodes retrieved with the laparoscopic approach has been described also in other fields of surgery as colorectal and esophageal. Many explanations are possible: the first is that even if laparoscopic nodal dissection is difficult, with time and practice the surgeon becomes more skilled day by day overcoming the initial difficulties and capitalizing the better view and precision offered by laparoscopy. Modern laparoscopic cameras amplify nervous, vascular and fascial structures helping the surgeon to identify correct planes and dissecting lymph nodes. Moreover the last generation surgical instruments for tissue sealing and cutting allow the surgeon to gain an optimal hemostasis, reducing damages to surrounding structures and making lymphadenectomy easier and more extensive, with lesser risk of lymphatic leak from properly sealed lymphatic vessels.

Some authors speculated that a possible bias affecting the good results of laparoscopic D2 lymphadenectomy could be a lower BMI in minimally invasive treatment patients, but Lu *et al.* in a recent meta-analysis on ten non-randomized trials on distal gastrectomy evidenced how no statistically significant differences were found in terms of BMI and number of total lymph nodes harvested and rate of positive nodes between the two groups (10).

Spleen preserving lymphadenectomy

A particularly challenging maneuver by laparoscopy, when needed, is the spleen preserving lymphadenectomy of the stations No. 10. The first report of this maneuver was made by Hyung *et al.* in 2008 (11). This is an extremely difficult dissection because of the deep location of the splenic hilum, the narrow space and anatomical variability of the splenic artery branches. The risk of not easily manageable bleeding,

of injuries to pancreas or spleen or adrenal gland is high and probably this is the reason why this procedure is not so diffuse, especially in Western countries. In fact a learning curve of about 40 cases has been proposed for this specific maneuver (12). Nevertheless it is technically feasible by laparoscopy and it is becoming more accepted by an increasing number of experts. Basically two approach are used: the first dissecting initially the stations No. 11p, 11d and then No. 10, the second dissecting station No. 10 first and subsequently the 11d and 11p (12). In order to preoperatively quantify the difficulty of this dissection Li *et al.* produced a “difficulty score” based on male gender, BMI >25, presence of splenic lobar arteries ≥ 3 and with a distributed-type and divided patients in three category of difficulty: low, intermediate and high. They found that most of patients were in the intermediate group (71.6%) but only 43.6% of them had a long lasting operation time. Only 13.9% of patients were in high difficulty group but 90.9% of them required a long operating time. They concluded that less skilled surgeons should face only low difficulty spleen preserving lymphadenectomy (13).

General considerations

The minimally invasive approach to D2 lymphadenectomy seems to be associated to a comparable incidence of specific complications as chyle leak, pancreatitis and pancreatic fistula as evidenced in a case-control study on 266 gastric cancer patients submitted to laparoscopic or open distal gastrectomy + D2 lymphadenectomy (14) and some recent meta-analysis on AGC and total gastrectomy in more than 2,000 patients (15,16).

Almost all reports from literature evidence how the laparoscopic approach to gastric cancer is associated with a longer operative time of about 60–90 minutes respect traditional open surgery and often is a statistically significant difference (14,16,17). Probably one of the main reasons is that the laparoscopic lymphadenectomy is a complex and time-consuming procedure, even if some authors now reports comparable operating time, suggesting that with practice our performances can be improved (18).

On the other hand, laparoscopy allows to halve the intraoperative blood loss and to reduce the need for blood transfusions as observed by many authors (17,18).

Conclusions

The laparoscopic D2 lymphadenectomy represents a challenging procedure for surgeons and dissection of some stations represents a really difficult step. Nevertheless

available data, even if not always with high level of evidence, suggest that is a feasible procedure at least as effective as with open approach. A learning curve of 40 cases is suggested by many authors (19,20) but it's an hard goal to reach, particularly for surgeons from countries where gastric cancer has not an high incidence. Even for this reason laparoscopic surgery for gastric cancer should be centralized in high volume centers in order to maximize results.

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Footnote

Conflicts of Interest: The authors have no conflicts of interest to declare.

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