

## Diagnostic Laparoscopy in Digestive Cancers: Is it Useful? The Experience of a Third World Low-Volume Institute After 70 Consecutives Cases

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### Abstract

**Aim of the Study:** Despite the availability of high quality imaging modalities, 25-40% of patients who underwent a laparotomy for digestive cancer could not be resected, with non-resectability identified only during laparotomy. This prevalence is higher in developing countries due to lack of adequate radiographic devices. This study was undertaken to assess the value of diagnostic laparoscopy in the management of digestive cancers in Cameroon, a poor setting.

**Patients and Methods:** From January 2010 to January 2016, a consecutive cohort of patients with gastro-intestinal tract malignancies who had undergone a diagnostic laparoscopy at our institution was queried prospectively.

**Results:** A total of 70 procedures were recorded among whom 25 (35.71%) diagnostic laparoscopy (DL), 5 (7.14%) staging laparoscopy (SL) and 40 (57.15%) laparoscopy first (LF). During DL, 44% of the suspected preoperative organ wasn't confirmed and the diagnosis was finally benign in 36.36%. After SL, the radiographic staging wasn't confirmed in 60% of the cases. During LF, contra-indications of curative surgery were found in 20% and 62.5% of patients eligible to resection were managed through laparoscopy-assisted approach with a morbidity rate of 5.2%.

**Conclusion:** The present analysis supports the useful of diagnostic laparoscopy in the management of patients with digestive cancers in a developing country.

**Keywords:** Diagnostic laparoscopy, Staging laparoscopy, Laparoscopy first- Digestive cancers, Africa

### Introduction

Surgical resection remains the mainstay of curative treatment of patients with digestive cancers. The treatment options are usually based on the preoperative staging by imaging modalities and accurate staging being mandatory in the selection process. Despite the availability of high quality imaging including ultrasonography (US), endoscopic ultrasonography (EUS), computed tomography (CT) and magnetic resonance imaging (MRI), 25-40% of patients who underwent a laparotomy for digestive cancer could not be resected, with non-resectability identified only during laparotomy [1,2]. It was previously reported that CT or EUS has an accuracy of 60-83% in determining the T-stage of gastric cancer [3-5]. In a study of D'ANGELICA et al. [6] of 410 patients with radiographically resectable hepatobiliary malignancy, 37.3% of them presented a disease that precluded resection during surgery. RAHUSEN et al. [7] found in 50 patients, considered to be candidates for resection of a colorectal liver metastasis on the basis of preoperative imaging studies, that 24 (48%) were deemed to have an unresectable disease after a surgical procedure.

Patients who underwent an unnecessary laparotomy have a higher morbidity-risk and an elevated hospital cost. Therefore, the optimal assessment of preoperative staging in patients with digestive malignancy is crucial.

The use of minimally invasive surgery has become widely accepted in many gastrointestinal fields, even in malignancies. A recent Cochrane review of 15 studies and a total of 1015 patients showed that diagnostic laparoscopy prior to laparotomy can decrease the rate of unnecessary laparotomy from 40 to 17% in patients with pancreatic

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and periampullar cancer found to have resectable disease from CT scan [8]. Staging laparoscopy has been proposed as a minimally invasive technique for identification of radiographically occult metastatic or locally unresectable disease [7,9-12].

In Africa, there is a paucity of imaging devices and when they are available they aren't accessible for most people because of their high cost. NAR et al. [13] estimated that less than 20% of the population in developing countries have access to imaging devices.

In Cameroon particularly, EUS and MRI aren't available in the whole country and the CT scan are mostly of second generation 8-row. This leads to poor images quality with a high prevalence of uncertain diagnosis, misdiagnosis and underestimated malignancy staging. However, laparoscopy have been already introduced and practiced in some unit as shown in past publications [14-17]. Therefore, this study was undertaken to assess the value of diagnostic laparoscopy in the management of digestive cancers in Cameroon, a poor setting.

## Patients and Methods

### Patients

From January 2010 to January 2016, a consecutive cohort of patients with gastro-intestinal tract (GIT) malignancies who had undergone a diagnostic laparoscopy at our institution (visceral and laparoscopic surgery unit of the National Insurance Health Center of Essos, Yaoundé/Cameroon) was analyzed prospectively.

Were excluded from the study, patients with:

- Non-GIT cancers (lymphomas, gynecologic cancers, genitourinary cancers, retroperitoneal sarcoma, sarcoma and abdominal metastasis of non GIT cancers)
- Metastatic known-GIT cancers who were beyond the scope of curative surgery
- Severe comorbidities: cardiopulmonary failure, severe coagulopathy, chronic renal failure.

### Preoperative work-up

All patients underwent investigations including abdominal US, abdominal CT-scan, chest X-ray, complete blood counts, renal function tests and liver function tests. Preparation for surgery included antibiotic prophylaxis.

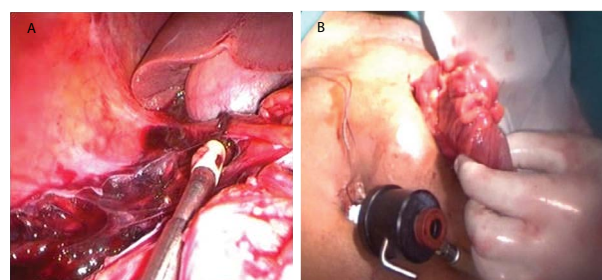
### Diagnostic laparoscopy

We classified diagnostic laparoscopy into 2 categories (Table 1)

- Diagnostic laparoscopy (DL): for patients with a malignancy diagnosis remained uncertain despite investigations. This procedure was conducted only for diagnosis and surgery was further planned if indicated.
- Staging laparoscopy: staging laparoscopy was divided into 2 groups:
  - Staging laparoscopy (SL): as a separate procedure from a possible curative surgery, for patients with doubtful malignancy staging.
  - Laparoscopy first (LF): conducted just before curative

Diagnostic Laparoscopy	
Diagnostic laparoscopy (DL)	Staging laparoscopy
	<ul style="list-style-type: none"> <li>• <b>Staging laparoscopy (SL)</b> For patients with doubtful malignancy staging as a separate procedure from a possible curative surgery</li> <li>• <b>Laparoscopy first (LF)</b> Just before planned curative surgery for patients with radiographically resectable digestive malignancy, as the first part of the surgical procedure</li> </ul>
For malignancy diagnosis remained uncertain despite investigations, surgery planned further if indicated.	

**Table 1:** Classification of diagnostic laparoscopy.



**Figure 1:** Laparoscopy-assisted right colectomy

**A:** Intracorporeal right colic mobilization.

**B:** Right Colic Externalization for Extracorporeal Resection and Anastomosis

surgery for patients with radiographically resectable digestive malignancy, as the first part of the surgical procedure.

### Surgical technique

The patient, under general anesthesia, was placed in the supine position. The first 10mm optic port was inserted in supra-umbilical by "open-coelioscopy" and the pneumoperitoneum achieved through this access. Two 5mm working ports (if necessary) was inserted under sight control. Their positions were functioned according to the findings and the organ involved: lumbar regions (left and/or right), hypogastric or epigastric regions. A systematic and thorough visual exploration of the abdominal cavity was performed. All adhesions that interfere with proper exploration were lysed. Liver surface, the undersurface of the diaphragm, the hepatic ligament round, the omentum and all peritoneal surfaces were carefully examined for possible implants. The surrounding structures of the organ involved were also carefully examined. If necessary, any suspicious lesion was biopsied. We didn't performed laparoscopic ultrasound (LUS). Determinants of unresectability were: vascular invasion (aorta, vena cava), diffuse peritoneal carcinomatosis, multiple bilobar hepatic metastasis and locoregional tumor invasion.

For patients who underwent LF, if none contra-indication of resectability was found, the curative surgery was immediately performed laparoscopically or the procedure converted to (open) laparotomy. Laparoscopic curative surgery were "laparoscopy-assisted" (Figure 1) with intracorporeal mobilization of the organ (Figure 1A) and externalization through a small parietal incision (Figure 1B) for resection and anastomosis.

### Postoperative work-up

All patients received standard postoperative care with

intravenous fluids, analgesics, deep vein thrombosis prophylaxis, postoperative antibiotics (if necessary) and chest physiotherapy. Palliative measures was initiated for patients with non-resectable malignancy and adjuvant therapies (if indicated) for the resected ones.

All statistical analysis were performed with SPSS software, version 17.

## Ethics

All patients had given their consent before inclusion in the study. We obtained the approval of the human ethics committee of our institute.

## Results

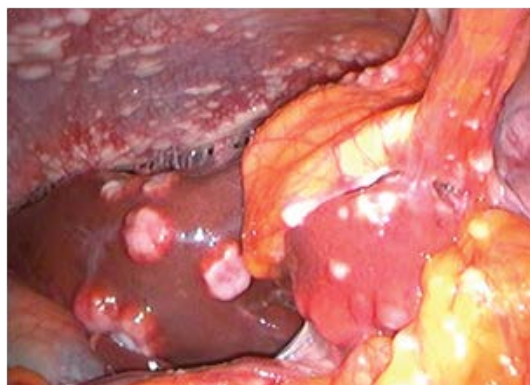
A total of 70 diagnostics laparoscopy were recorded corresponding to 70 patients. Their mean age was 48.3 years (range, 13-83) and forty-five (64.28%) of them were female.

According to our classification of diagnostic laparoscopy, we conducted (Table 2) 25 DL (35.71%), 5 SL (7.14%) and 40 LF (57.15%).

Among the 25 patients who undergone a DL, the preoperative uncertain diagnosis was gastric tumors (3 cases), right colic tumor (6 cases), left colic tumor (6 cases), disseminated carcinomatosis of an unknown origin (4 cases) and suspect hepatic nodules (6 cases). DL was able to identified the clearly the organ involved in all cases (100%). In 11 of them (44%) the suspected preoperative organ involved wasn't confirmed. During DL, we achieved biopsies in 22 patients (88%) out of which the malignancy diagnosis wasn't confirmed in 8 cases (36.36%). For example, within the 4 cases of preoperative suspected disseminated carcinomatosis of an unknown origin, we found 3 cases of peritoneal tuberculosis and 1 case of disseminated carcinomatosis (Figure 2) related to a rectal tumor. Table 3 resumes the pre- and postoperative diagnosis after DL.

Type of diagnostic laparoscopy	Number of patients	Percentage
DL	25	35.71%
Staging laparoscopy	SL	5
	LF	40
Total	70	100%

**Table 2:** Repartition of patients according to the different types of diagnostic laparoscopy.



**Figure 2:** Peritoneal Carcinomatosis.

Preoperative diagnosis	Number	Postoperative diagnosis	Number
Gastric tumor	3	Omental tumor	1
		Transverse colic tumor	1
		Gastric tumor	1
Right colic tumor	6	Mesenteric cyst	3
		Small bowel tumor	2
		Right colic tumor	1
Left colic tumor	6	Left colic tumor	2
		Small bowel tumor	2
		Sigmoid tumor	2
Disseminated carcinoma-tosis of unknown origin	4	Peritoneal tuberculosis	3
		Rectal tumor with disseminated carcinomatosis	1
Suspect hepatic nodules	6	Benign liver cyst	2
		cirrhosis	1
		Hepatocellular carcinoma	3

**Table 3:** Pre- and postoperative diagnosis after DL.

Preoperative staging	Organ concerned	Number	Postoperative staging
T3N0M0	Transverse colon	1	T4N0M0
	Stomach	1	T4N0M0
	Upper rectum	1	T3N0M0
T4N0M0	Upper rectum	1	T4N2M1
	Stomach	1	T4N0M0

**Table 4:** Pre- and postoperative staging.

In regard to 5 SL conducted, the radiographic staging was confirmed in 2 cases (40%), the cancer found spread to surrounding structures or disseminated in 3 cases (60%). Table 4 resumes the pre- and postoperative staging.

During the 40 LF, contra-indications of curative surgery was found in 8 cases (20%) including dissemination to surrounding structures (5 cases), peritoneal carcinomatosis (1 case) and extensive nodal disease (2 cases). Thirty-two patients (80%) had a curative resection; 20 were laparoscopy-assisted (62.5%) and 12 (37.5%) converted to laparotomy. Among the 20 laparoscopy-assisted procedures we had 12 right colic cancers, 6 left colic cancers and 2 small bowel tumors. Reasons of conversion to laparotomy included: laparoscopic dissection difficulties (8 cases), incidental lesion of a surrounding organ (1 case) and massive hemorrhage (3 cases).

The mean hospital stays for patients after DL or SL was 1.6 days (range, 1-3), 4.5 days (range, 3-7) after a coelio-assisted curative resection and 6.5 days (range, 5-10) for those who were converted to laparotomy. The 12 patients who had undergone open surgery excluded, we noticed within the 58 others a morbidity in 3 cases (5.2%) including wound infection (1 case), pneumonia (1 case) and 1 case of a residual intra-abdominal abscess which was drained laparoscopically. None death was recorded during the first postoperative month.

## Discussion

This study demonstrates 3 advantages of diagnostic laparoscopy in digestive cancers: Diagnosing uncertain malignancy conditions, improving staging and improving the short term outcome of curative surgery.



## Diagnosing Uncertain Malignancy Conditions

After a battery of investigation remaining dissatisfied, some patients had an uncertain malignancy diagnosis [18,19]. In developing countries as our own, this situation is quite common due to lack of adequate imaging devices; in our institute we used a second generation 8-row CT scan. DL provides an intermediate option, avoiding full exploratory laparotomy and minimizing the surgical trauma; we were able to identify the organ involved in 100% of cases and a biopsy was achieved in 88% of patients, leading to a tissue diagnosis which was benign in 40% of cases. It's already known in the literature that DL is a safe, quick and effective adjunct to diagnostic modalities for establish a conclusive diagnosis in uncertain chronic conditions [13,20-23].

DL cannot replace a careful clinical examination and adequate radiological investigations which have to be improved and modernized as well as possible.

## Improving Staging of Digestive Cancers

Given the significant economic impact of a digestive cancer particularly in developing countries with limited financial resources and lack of insurance policies, the treatment strategies should be optimized in terms of both patient benefit and cost-effectiveness. Even in developing countries with all radiographic imaging facilities, 25-40% of patients who underwent a laparotomy for digestive cancer could not be resected, with non-resectability identified only during laparotomy [1,2]. Despite continuous improvements in preoperative staging techniques, some metastatic disease can be radiographically occult and will lead to unnecessary laparotomy with an increase of morbidities and hospitals fees. In our study, staging laparoscopy as a separate procedure from surgery (SL) or as first part of a potential curative surgery (LF) revealed respectively 60% and 20% of contra-indication of cancer resection and palliative measures was then initiated. Diagnostic laparoscopy appears therefore to be a good ultimate diagnosis staging tool. We think that LF should be the first part of every resection-intent surgery of a digestive cancer even if laparotomy is the approach chosen for resection. After our study this recommendation became mandatory in our unit. Rahusen et al. [7] showed that the combination of DL and LUS significantly improves the selection of candidates for resection of colorectal liver metastases.

## Improving the Short Term Outcome of Curative Surgery

Diagnostic laparoscopy proves to avoid unnecessary laparotomies with their related morbidities and elevated hospitals charges. In another hand, when none contra-indication for curative surgery is found, resection can be conducted totally laparoscopically or laparoscopy-assisted. In our study, 62.5% of the 32 patients eligible for resection were managed by laparoscopy-assisted resection with low morbidity and shorts hospital stays. We don't need to demonstrate that patients that undergo a laparoscopic approach fair better than those that undergo an open approach with no higher incidence of complications, this information is already evident in published literature [24-26]. The cost is usually advocated to justify the lower use of laparoscopy in developing countries. However, 2 recent studies [9,27] comparing the cost-effectiveness of

diagnostic laparoscopy prior to laparotomy versus surgery first, support the cost-effectiveness of routine diagnostic laparoscopy before curative resection. In Cameroon, and in Africa in general, the vulgarization of health insurance policies could lead to the same result.

## Conclusion

The present analysis supports the useful of diagnostic laparoscopy in the management of patients with digestive cancers because it permits to: improve the diagnosis of uncertain malignant conditions, improves cancer staging to avoid unnecessary laparotomies in patients with radiographically resectable diseases and improve the short term outcomes of curative surgery. We think that a LF should be performed before surgical resection of a digestive cancer, as the first part of the procedure, even if laparotomy is the approach chosen for resection.

## Competing Interests

The authors declare that they have no competing interest.

## Authors Contribution

All persons designated as authors above, qualify for authorship, they took active part in the management of these patients and write up of this manuscript. All authors have read and agreed to the final manuscript.

## References

1. Lillemo KD, Cameron JL, Hardacre JM, et al. Is prophylactic gastrectomy indicated for unresectable periampullary cancer? A prospective randomized trial. *Ann Surg.* 1999;230(3):322-328.
2. Mayo SC, Austin DF, Sheppard BC, Mori M, Shipley DK, Bilingsley KG. Evolving preoperative evaluation of patients with pancreatic cancer: does laparoscopy have a role in the current era? *J Am Coll Surg.* 2009;208(1):87-95.
3. Jurgensen C, Brand J, Nothnagel M, et al. Prognostic relevance of gastric cancer staging by endoscopic ultrasound. *Surg Endosc.* 2013(4);27:1124-1129.
4. Leake PA, Cardoso R, Seevaratnam R, et al. A systematic review of the accuracy and indications for diagnostic laparoscopy prior to curative-intent resection of gastric cancer. *Gastric Cancer.* 2012;15(1):38-47.
5. Seevaratnam R, Cardoso R, McGregor C, et al. How useful is preoperative imaging for tumor, node, metastasis (TNM) staging of gastric cancers? A meta-analysis. *Gastric Cancer.* 2012;15(Suppl 1): S3-18.
6. D'angelica M, Fong Y, Weber S, et al. The role of staging laparoscopy in hepatobiliary malignancy: prospective analysis of 401 cases. *Ann Surg Oncol.* 2003;10(2):183-189.
7. Rahusen FD, Cuesta MA, Borgstein PT, et al. Selection of patients for resection of colorectal metastasis to the liver using diagnostic laparoscopy and laparoscopic ultrasonography. *Ann Surg.* 1999;230(1):31-37.
8. Allen VB, Gurusamy KS, Takwoingi Y, Kalia A, Davidson BR. Diagnostic accuracy of laparoscopy following CT scanning for assessing the resectability in pancreatic and periampullary cancer. *Cochrane Database of Syst Rev.* 2013;25:11.
9. Morris S, Gurusamy KS, Sheringham J, Davidson BR. Cost-effectiveness of diagnostic laparoscopy for assessing resectability in pancreatic and periampullary cancer. *BMC Gastroenterol.* 2015;15:44.
10. Yan-Feng Hu, Zhen-Wei Deng, Hao Liu, et al. Staging laparoscopy improves treatment decision-making for advanced gastric cancer. *World J Gastroenterol.* 2016;22(5):1859-1868.
11. Gaujoux S, Allen PJ. Role of staging laparoscopy in peri-pancreatic and hepatobiliary malignancy. *World J Gastrointest Surg.* 2010;2(9):283-290.

12. Cho H, Yamamoto H, Kainuma O, et al. Laparoscopy in the management of hilar cholangiocarcinoma. *World J Gastroenterol*. 2014;20(41):15153-15157.
13. Nar AS, Bawa A, Mishra A, Mittal A. Role of diagnostic laparoscopy in chronic abdominal conditions with uncertain diagnosis. *Niger J Surg*. 2014;20(2):75-78.
14. Nana Oumarou B, Bang GA, Guifo ML, Ngo Nonga B, Essomba A, Sosso MA. Is laparoscopy feasible and effective for acute postoperative small bowel obstruction in Africa? A case report in Yaoundé, Cameroon. *PAMJ*. 2016;23:178.
15. Nana Oumarou B, Bang GA, Guifo ML, Ngo Nonga B, Essomba A, Sosso MA. Laparoscopic surgery for groin hernia in a third world country: A report of 9 cases of transabdominal pre-peritoneal (TAPP) repair in Yaoundé, Cameroon. *PAMJ*. 2016;23:246.
16. NANABO, BANG GA, OUSMANAO, EKANIYMB, ESSOMBAA, TAKONGMO S, SOSSO M. Laparoscopic segmental colectomy as management of a delayed post colonoscopic polypectomy bleeding. A case report in Yaoundé (Cameroon) - A third world country. *World J Lap Surg*. 2014;7(2):98-100.
17. Nana Oumarou B, Takongmo S, Essomba A, Nocca D, Sosso MA. Hemicolectomie droite par voie laparoscopique pour cancer du colon ascendant. Expérience préliminaire a Yaounde(Cameroun). *Journal de coelio-chirurgie* 2010;76:56-59.
18. Easter DW, Cuschieria A, Nathanson LK, Lavelle-jones M. The utility of diagnostic laparoscopy for abdominal disorders. Audit of 120 patients. *Arch Surg*. 1992;127(4):379-383.
19. Schrenk P, Woisetschlager R, Wayand WU, Rieger R, Sulzbacher H. Diagnostic laparoscopy: A survey of 92 patients. *Am J Surg*. 1994;168(4):348-351.
20. Salky B. Diagnostic laparoscopy. *Surg Laparosc Endosc*. 1993;3(2):132-134.
21. Al-Akeely MH. The impact of elective diagnostic laparoscopy in chronic abdominal disorders. *Saudi J Gastroenterol*. 2006;12(1):27-30.
22. Mann GB, Conlon KC, Laquaglia M, Dougherty E, Moskowitz CH, Zelenetz AD. Emerging role of laparoscopy in the diagnosis of lymphoma. *J Clin Oncol*. 1998;16(5):1909-1915.
23. SAGES (Society of American Gastrointestinal and Endoscopic Surgeons). Guidelines for diagnostic laparoscopy. <http://www.sagecms.org/publications/guidelines/guidelines-for-diagnostic-laparoscopy/>.
24. Adams S, Wilson T, Brown AR. Laparoscopic management of acute small bowel obstruction. *Aus N Z J Surg*. 1993;63(1):39-41.
25. Henry J, Lujan, Aeyal Oren, Gustavo Plasencia, Gustavo Canelon, Eddie Gomez, Alejandro Hernandez-Cano, et al. Laparoscopic management as the initial treatment of acute small bowel obstruction. *JSLs*. 2006;10(4):23-35.
26. Kelly KN, Iannuzzi JC, Rickles AS, Garimella V, Monson JR, Fleming FJ. Laparotomy for small bowel obstruction: first choice or last resort for adhesiolysis? A laparoscopic approach for small-bowel obstruction reduces 30-day complications. *Surg Endosc*. 2014;28(1):65-73.
27. Jayakrishnan TT, Nadeem H, Groeschl RT, et al. Diagnostic laparoscopy should be performed before definitive resection for pancreatic cancer: a financial argument. *HPB*. 2015;17(2):131-139.