Full Length Article

Safety and feasibility of laparoscopic colo-rectal surgery for cancer at a tertiary center in a developing country: Egypt as an example

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Abstract  Background: Laparoscopic colectomy has been shown to have significant short- and long-term benefits compared to open approach. The incorporation of laparoscopy in developing countries is challenging, due to the high costs of equipment and lack of expertise. The aim of this study was to evaluate the safety and feasibility of laparoscopic colorectal surgery for cancer that could be performed in developing countries under different circumstances in developed countries.

Methods: Thirty-seven patients (23 males and 14 females) with colorectal cancer with a median age of 46 years (39–72) have been enrolled for laparoscopic colo-rectal surgery in a tertiary center in Egypt (South Egypt Cancer Institute) with the trend of reuse of some disposable laparoscopic instruments.

Results: The median operative time was 130 min (95–195 min). The median estimated blood loss was 70 ml (30–90 ml). No major intra-operative complications have been encountered. Two cases (5.5%) have been converted because of local advancement (one case) and bleeding with unavailability of vessel sealing device at that time (one case). The median time for passing flatus after surgery was 36 h (12–72 h). The median hospital stay was 4.8 days (4–7 days). The peri-operative period passed without events. Pathologic outcome revealed that the median number of retrieved lymph nodes was 14 (range 9–23 lymph node) and all cases had free surgical margin.

Conclusion: Laparoscopic colorectal surgery for cancer in developing countries could be safe and feasible. Safe reuse of disposable expensive parts of some laparoscopic instruments could help in propagation of this technique in developing countries.

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Introduction

Background

Laparoscopic colectomy has been shown to have significant short- and long-term benefits compared with the open approach [1–5]. Despite the evidence from multiple, prospective, randomized trials, the adoption rate of laparoscopic colectomy has been reported to be low. In a recent study by Robinson et al., of all colorectal surgeries performed in high volume hospitals, only 7.3% have been performed using minimal invasive surgery (MIS). They found a significant socioeconomic disparity in the use of MIS [6].

The incorporation of laparoscopic techniques in developing countries has been challenging, due in particular to the high costs of equipment and lack of expertise [7]. However; many laparoscopic procedures, including appendectomy, cholecystectomy, hysterectomy and splenectomy have been successfully performed in developing countries [8–10].

Demonstrating oncologic outcomes similar to those achieved in a developed setting will further support and encourage the continued growth of laparoscopy for cancer in developing countries [2,11–14]. There are currently limited data referring to the surgical safety and the oncologic feasibility of laparoscopic colorectal surgery for cancer in the situation of limited equipment in developing settings [15].

Therefore, the aim of this study was to evaluate the safety and feasibility of laparoscopic colorectal surgery for cancer that could be performed under different circumstances in developed countries in a tertiary center in Egypt as an example of developing countries.

Patients and methods

This is a feasibility and safety, phase I/II clinical non randomized study. The study was conducted at South Egypt Cancer Institute, Assiut University, Egypt. Thirty-seven patients (23 males and 14 females) have been enrolled for laparoscopic colo-rectal surgery for colorectal cancer in the period of March 2011 to March 2014. The diagnosis of colorectal cancer was confirmed with colonoscopy and biopsy. Preoperative workup has included blood tests, chest X-ray and serum carcino-embryonic antigen (CEA). CT pelvic-abdominal scan was a routine. The study was approved by the ethics committee at South Egypt Cancer Institute. The surgical approach was decided with the consent of the patients after a thorough discussion on the advantages and risks of the approach.

Inclusion criteria were histologically proven carcinoma of the colon or upper half of the rectum, T1 to T3 tumors according to TNM classification, no evidence of extra-colonic or extra-rectal extension or distant metastasis by means of CT, abdominal ultrasound and postero-anterior chest radiograph. Patients with large, fixed tumors with invasion to other organs or patients with distant metastasis were excluded from the laparoscopic trial.

The patients have received mechanical bowel preparation the day before surgery and prophylactic intravenous antibiotics were administered at the time of induction of anesthesia. A urinary catheter was inserted after the patient was put under general anesthesia. Naso-gastric tube was not used as a routine.

The patients were placed in a supine head down position for right hemi-colectomy and lithotomy with head down position for left hemi-colectomy and sigmoidectomy.

For economic causes, we usually use reusable laparoscopic instruments. For disposable instruments, we reuse it several times after proper sterilization, provided that it works efficiently. The only disposable laparoscopic instrument that has been used for several times in this study was the vascular sealing device. All other surgical instruments used in this study were reusable.

At the beginning of the procedure, the peritoneal cavity was accessed through an insufflations’ needle and carbon dioxide was insufflated to maintain the intra-abdominal pressure at 10–12 mmHg. For all cases, trans-umbilical 10 mm port was used for the camera. For right colon cancer another 2 to 3 ports of either 5 or 10 mm size were positioned so that convenient and safe dissection could be done as shown in Fig. 1a. For left colon and recto-sigmoid cancer, the ports were placed as in Fig. 1b. Dissection was performed in the majority of
patients by alternate between mono-polar and bipolar vascular sealing devices. Vessels were controlled with bipolar vascular sealing device or absorbable clips intra-corporeally in most circumstances. Following bowel mobilization and vessel division, the tumor-bearing segment was retrieved through an incision (4-5 cm long) at a convenient site. In case of a right sided colonic lesion, resection and anastomosis was performed extra-corporeally by interrupted hand sutures. Colorectal or coloanal anastomosis was performed by hand suturing or using a circular stapler which was inserted trans-anally. Colorectal mobilization and resection followed the same principles as in open surgery.

Conversion was defined as the need for making the abdominal incision for bowel mobilization and/or vascular control. Operative mortality was defined as death that occurred during the same hospital stay or within 30 days following the primary operation. Operative morbidities were defined as complications that resulted in prolonged hospital stay or additional interventions or procedures [14].

Data collection and statistical analysis

Data on the patient’s demographics, medical comorbidities, location of the tumors, operative details, postoperative outcomes, and follow up status were collected prospectively and entered into a data base. The data were described as median and range.

Results

In the period of March 2011 till March 2014, 37 cases (23 males and 14 females) of colorectal cancer have been enrolled for laparoscopic colorectal resection. The mean age was 47 years (39–72) and the average body mass index (BMI) was 29 (26–33.5).

Right hemicolectomy was performed for 9 cases. Left hemicolectomy with sigmoidectomy was performed for 11 cases of proximal sigmoid cancer and anterior resection was done for 14 cases of recto-sigmoid cancer. Total colectomy with ileorectal anastomosis was performed for one case of cecal cancer on top of familial adenomatous polyposis coli (FAP). Two cases (5.5%) have been converted because of locally advanced stage (one case) and bleeding with unavailability of vessel sealing device (one case) (Table 1).

The median operative time for unconverted cases was 125 min (95–195). The median estimated blood loss was 70 ml (30–90 ml). No major intra-operative complications have been encountered. The median time for passing flatus after surgery was 36 h (12–72 h). The median hospital stay was 5 days (4–7 days). The peri-operative period passed without events.

Pathologic outcome revealed that the median number of retrieved lymph nodes was 17 (range 9–23 lymph node) and all cases have free surgical margin.

The median number of reuse of the vascular sealing device was 5 times (4–7 times) and the estimated reduction in its cost in comparison to single use was 80% including sterilization cost. This means that the cost for every case was reduced by 560 USD.

Discussion

The present study provides further evidence regarding the oncologic feasibility and surgical safety of laparoscopic colorectal surgery in developing countries.

For the patients of colorectal cancer in developing countries to get the benefits of the MIS, we believe that safe reuse of disposable laparoscopic instruments should be considered. In our experience we used for example the most recently introduced vessel sealing bipolar devices. However, for economic issues we safely re-used its disposable parts several times. We know that, the surgeon has the responsibility of determining the functional integrity of any surgical instrument before its use [16]. Under carefully monitored conditions and strict guidelines, reuse of disposable laparoscopic instruments can be cost-effective [16,17]. Several times reuse of the vascular sealing devices, has reduced its cost by about 80% that means 560 USD at the time of the study which is a good financial benefit regarding Egypt economy.

The experience accumulated in our institution over 3 years with mixed use of disposable and reusable laparoscopic instruments demonstrates that reuse of disposable laparoscopic instruments could be economical. The judicious choice of disposable and reusable instruments could provide the best possible tools for the surgeons in developing countries to perform laparoscopic procedures provided that patient safety and oncologic feasibility could be maintained [17,18].

Introducing laparoscopy for cancer into developing countries with its advantages that have been established in developed countries and at the same time as an economically acceptable procedure, could aid in its spread so that patients in developing countries can get its benefits [2,11–14].

In Egypt, because of limited resources and the expenses of MIS, laparoscopic colorectal surgery is restricted in use for a few tertiary centers with only few cases being treated every year. For our knowledge, this is the first study that evaluates the current practice of laparoscopic colorectal surgery in Egypt addressing the issue of reuse of disposable laparoscopic instruments. The results of this study have showed that we could perform successfully various types of laparoscopic colo-rectal surgery for cancer in 35 of 37 cases (right hemicolectomy, left hemicolectomy or anterior resection).

We included cases of recto-sigmoid cancers because some studies show that the pattern of recurrence and survival of patients with upper rectal cancer were similar to those of sigmoid cancer and technically anterior resection for upper rectal cancer does not differ significantly from surgery for a sigmoid cancer [19]. For most of the cases, dissection and mobilization were performed in a medial to lateral fashion.

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Lesion</th>
<th>Number</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Rt. hemicolectomy</td>
<td>Cecal</td>
<td>5/37</td>
<td>13.5</td>
</tr>
<tr>
<td></td>
<td>Rt. colon</td>
<td>2/37</td>
<td>5.5</td>
</tr>
<tr>
<td></td>
<td>Hepatic flexure</td>
<td>2/37</td>
<td>5.5</td>
</tr>
<tr>
<td>2. Lt. hemicolectomy with</td>
<td>Proximal</td>
<td>11/37</td>
<td>30</td>
</tr>
<tr>
<td>sigmoidectomy</td>
<td>sigmoid</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Anterior resection</td>
<td>Rectosigmoid</td>
<td>14/37</td>
<td>37.5</td>
</tr>
<tr>
<td>4. Total colectomy</td>
<td>FAP with cecal</td>
<td>1/37</td>
<td>2.7</td>
</tr>
<tr>
<td></td>
<td>cancer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Conversion</td>
<td></td>
<td>2/37</td>
<td>5.5</td>
</tr>
</tbody>
</table>
In this series, the patients have average body mass index (BMI) of 29 (26–33.5). Laparoscopic colectomy is safe and feasible in patients with high BMI, with no significant difference in recovery of intestinal function and length of hospital stay compared to patients with normal BMI [20,21].

Operative morbidity is a very important issue, in this series the mean operative time was 110 min and the mean estimated blood loss was 70 ml which are similar to other series [14,15]. Only one case has been converted because of bleeding and unavailability of vascular sealing device, fortunately, this case was early in this study, therefore after that case and to avoid conversion, we have provided a new instrument in operative room so that it can be used if the reused instrument failed to work during surgery.

In comparison to other studies, patients with laparoscopic resection in our series had similar short duration of ileus and early resumption of diet [1,2]. The hospital stay was also significantly short. Although we did not experience tremendous pressure for a short hospital stay and early discharge, the median hospital stay for our patients with laparoscopic resection was 5 days. Our series had very similar short term results compared to those of North American and other large multi-center trials and the meta-analysis of randomized control trials. These trials showed that significant early benefits measured as less surgical complications, less intra-operative blood loss and less narcotic use can be achieved with laparoscopy. The meta-analysis also noted a significantly short time to first bowel movement and discharge from hospital [1,2–26].

Dissection through small incision, precise dissection helped by magnification and avoidance of visceral handling could be helping in early recovery of gut function [1,26]. In our study, there was no evidence of deep venous thrombosis or pulmonary complications except for one case with hypertension and diabetes. This might be because of early ambulation and less postoperative pain. All these factors have contributed to the short post-operative hospital stay.

We believe that, the most important detail in cancer surgery is to respect the oncologic principals. In this series, the median number of retrieved lymph nodes was 14 which is consistent with the minimum of 12 lymph nodes required for accurate staging [26]. All cases have negative surgical margins. Therefore our pathological results were similar to most of the large trials [1,26].

In conclusion, laparoscopic colectomy for cancer in developing countries could be safe and feasible and gives similar results for those of multicenter trials. Safe reuse of disposable expensive parts of some laparoscopic instruments could help in propagation of this technique in developing countries. Long term follow up as well as comparative studies with open surgery are required.

Conflict of interest

The Authors have no conflicts of interest or financial ties to disclose.

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References


Laparoscopic colo-rectal surgery in a developing country