



ORIGINAL ARTICLE

EARLY EXPERIENCE IN LAPAROSCOPIC COLORECTAL RESECTION FOR COLORECTAL CARCINOMA: A RETROSPECTIVE STUDY

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Abstract

Aim: Assessment of the results of laparoscopic resection for colorectal carcinoma in terms of feasibility, early outcome, conversion rate, technical difficulties and complications.

Methods: All laparoscopic colon and rectal resections performed between January 2007 and July 2010 were included. Review of the perioperative data was done regarding patient selection and indication for surgery, the operative technique as well as the perioperative complications.

Results: 87 patients (53 males and 34 females), median age 53 years (range 24 to 79), underwent laparoscopic resection of the colon and rectum. The median Body Mass Index (BMI) was 23.5 (range 15.5 to 41.3). The indication for surgery was 42 rectal cancers and 34 colon cancers. The most common laparoscopic procedure performed was anterior resection (44.5 percent). The median duration of surgery was 130 minutes (range 65 to 330), with conversions to open surgery in only 3 patients (3.5 percent). Complications occurred in 16 patients (18.2 percent). The mean length of hospital stay was 7.9 days (range 4 to 26). The median number of lymph nodes harvested was 12 (range 4 to 46). The least follow up time was six months and the overall recurrence was 7 percent.

Conclusion: laparoscopic colorectal resection for colorectal carcinoma is a safe, feasible and beneficial procedure when used in experienced hands and with good patient selection.

Keywords: Colorectal tumours, surgical resection, Laparoscopic management.

INTRODUCTION

The role of laparoscopic surgery has gained acceptance in the treatment of benign diseases, but it remains controversial in the treatment of malignancies, because of concerns about adequacy of lymphadenectomy, the extent of resection, early findings of port-site metastasis, and the lack of long-term results.⁽¹⁾ There are some retrospective and prospective comparative studies

reporting on the feasibility and favorable outcome of laparoscopic surgery for colorectal cancer including earlier return of bowel motility,⁽²⁻⁵⁾ less postoperative pain, and shorter hospital stay.⁽⁶⁾

Recently, results of large randomized controlled trials comparing laparoscopic with conventional open surgery have been published, demonstrating that laparoscopic

surgery for colon cancer was equivalent to open surgery in terms of postoperative complications and long-term outcome in terms of recurrence and survival.⁽⁷⁻⁹⁾ After the publication of these trials, laparoscopic surgery for colon cancer has been recognized as an alternative treatment to open surgery. However, these studies did not include rectal cancer because of technical difficulties including anastomotic techniques, except the Conventional versus Laparoscopic-Assisted Surgery in Patients with Colorectal Cancer (CLASICC) trial, which included rectal cancer and showed impaired short-term outcomes in patients undergoing laparoscopic anterior resection for rectal cancer, and concluded that the routine use of laparoscopy for rectal cancer is not justified. There are some reports about the feasibility of laparoscopic surgery for rectal cancer, however, these studies included only a small number of patients, and the role of laparoscopy for rectal cancer remains to be defined.⁽¹⁰⁻¹⁴⁾

Because of the absence of long-term (5-year) data on survival and recurrence, the role of laparoscopy in rectal cancer resection has been debated. Additionally, clinicopathologic differences among patients such as body mass index (BMI), gender, tumor bulk, and tumor location have contributed to the challenges involved in studying this surgical modality.⁽¹⁵⁾

Currently, two major multicenter randomized controlled trials (RCTs) are being conducted in Europe and United States: the COLOR II trial and the ACOSOG-Z6051, respectively. Both are designed to compare laparoscopic versus open resection for curable rectal cancer, and their results will provide crucial information on the practice of laparoscopic rectal cancer resection.⁽¹⁶⁻¹⁸⁾

This retrospective study aims at assessment of the results of our experience in laparoscopic resection for colorectal carcinoma in terms of feasibility, early outcome, conversion rate, technical difficulties and complications.

PATIENTS AND METHODS

All laparoscopic colon and rectal resections performed between January 2007 and July 2010 in Kasr El-Aini teaching hospital, Cairo University and El Salam Oncology Center (Ministry of Health) were included in this retrospective study.

The clinical and operative records of 87 patients were retrospectively reviewed. The relevant clinical data, intraoperative parameters and postoperative outcomes were obtained for a minimum follow up period of six months.

All procedures were performed by consultant colorectal surgeons in the department, who had been trained in laparoscopic colorectal surgery in overseas centres of

excellence. All patients selected were having operable colorectal carcinomas with no –or-only one previous abdominal surgery.

42 patients with rectal carcinomas were given routine preoperative neoadjuvant radiotherapy according to the routine preoperative protocol.

All procedures were elective, with patients admitted two days prior to surgery to complete the preoperative work up and mechanical bowel preparation was performed the day prior to surgery. Thromboembolic prophylaxis with subcutaneous low molecular weight heparin was administered on the evening prior to surgery and continued daily from the first postoperative day until the patient was ambulant.

All procedures were performed under general anaesthesia and in the Lloyd Davies position a modified lithotomy position so that the buttocks are at the edge of the break. The patient's legs are placed in well-padded stirrups (Lloyd-Davies) after the pneumatic compression stockings have been applied on the lower legs. The stirrups are positioned so that the thighs are parallel to the abdominal wall. This allowed full use of the lower abdominal ports, especially when working in the upper quadrants. The patients were firmly secured to the operating table to allow for placement in the Trendelenburg position as required.

Carbon dioxide insufflation was used to create pneumoperitoneum, using the veress needle in the left hypochondrium for all cases maintaining a 12–15 mmHg intra-abdominal pressure and flow rate between 2-2.5 litres/minute. The first trocar (12mm) is placed in the peri-umbilical region slightly to the left in case of right sided colectomy and slightly to the right in case of left sided colectomy. All subsequent trocars were inserted under direct laparoscopic vision. Two (5mm) ports are placed in the right and left lower quadrants 2-3 cm medial to the anterior superior iliac spine outside the rectus muscle to avoid injury of epigastric vessels.

Another 12mm port is placed in the left upper quadrant in case of right sided colectomy or placed in the right upper quadrant in case of left sided colectomy outside the rectus muscle and about 8 cm from the umbilical port. Another 12mm port is placed in the suprapubic region in cases of rectal cancer if needed.

A combination of straightviewing zero-degree or 30-degree laparoscopes were used, according to the individual surgeon's preference. Dissection was facilitated by the use of harmonic shears (Harmonic-Scalpel, Ethicon Endo-Surgery Inc, Cincinnati, OH, USA), the Ligasure (Valleylab, Tyco Healthcare, Boulder, CO, USA) or laparoscopic scissors and electrocautery.

In all patients we use a standard technique of medial to lateral dissection of the mesocolon using an ultrasonic scalpel, followed by ligation of the artery and vein 1 cm close to their origin using vascular clips and ligation in some cases.

The tumour free margin of resection was 10 cm proximal and distal (2 cm distal for rectal cancer). In sigmoid resection and anterior rectal resection the splenic flexure was routinely mobilized.

In left sided colectomies and anterior resection intracorporeal anastomoses were performed using EEA circular stapplers (Covidian CDH size 29 or 31) while in right sided colectomies extracorporeal anastomoses were done.

The incision made for delivery of the resected specimen was decided by the individual surgeons, based on the site of the lesion and the procedure performed. Surgical drains were used in most of cases.

No prophylactic diversion stomas were performed for any of our patients as they all were elective resections and the patients were all well prepared for surgery.

Postoperatively, all patients were kept NPO for variable period of time according to the procedure performed, received combination antibiotics and analgesics combination of morphia and non-steroidal anti-inflammatory medications.

RESULTS

Over a three and half-year period from January 2007 to July 2010, 87 patients underwent laparoscopic resection of the colon and rectum for colorectal carcinoma. The patient demographics and indications for surgery are shown in Tables 1,2.

The most common laparoscopic procedure performed was anterior resection (44.5%); 18 patients were high while 21 patients were low anterior resection. High anterior resections were defined as those in which the colorectal anastomoses were established above the peritoneal reflection; low anterior resections referred to anastomoses that were established below the peritoneal reflection. Left colon and sigmoid resections represent 21.5% of the total cases. Table 3 shows the distribution of procedures performed.

The median duration of surgery was 130 minutes (range 65 to 330), The median length of the incision for extraction of a specimen was 5 (range 3–13) cm and the median number of lymph nodes harvested was 12 (range 4–46).

Most of the resected tumours were stage II & III according to TNM staging system (67cases). 15 cases had stage I tumour while only 5 cases were stage IV.

Conversion to open surgery was necessary in 3 cases (3.5%) one of them was due to equipment failure while inaccessible tumour site and morbid obesity were the other two reasons for conversion. The mean time of resuming oral intake was 3 days ranging from 1-8 days and the mean length of hospital stay was 7.9 days ranging from 4-26 days. Complications occurred in 16 (18.2%) patients, and the distribution of surgery related complications is shown in Table 4.

Early postoperative complications were defined as complications occurring within 30 days after surgery; late complications were defined as those occurring >30 days after surgery.

Patients were followed up for a minimum time of six months with 6 patients lost to follow up. Port site recurrence was detected in one patient, Local recurrence in 2 patients of low anterior resection and 5 patients had systemic recurrence mainly hepatic metastasis 2 of them are those who had local recurrence representing a total of nearly (7%) recurrence rate.

Table 5 demonstrates the tumour characteristics according to histopathology.

Subgroup analysis comparing the results of laparoscopic resection of the rectum including anterior resection and abdominoperineal resection as compared to colon resection both RT. And LT. Colons, the surgical resection was more challenging and lengthy in rectal cases as compared to laparoscopic c olectomies as well as the complication rate including recurrence. Table 6 summarizes the results of this comparison.

As well subgroup analysis of patients underwent laparoscopic anterior resection for patients received preoperative neoadjuvant radiotherapy showed no added technical difficulties as compared to those who did not receive preoperative radiotherapy. However the two cases with anastomotic leakage reported in our series occurred in patients who received preoperative radiotherapy but no cases of local recurrence among those received the neoadjuvant radiotherapy as compared to the two cases of local recurrence reported among patients who did not receive the neoadjuvant radiotherapy.

Table 1. Patient demographics.

Patient demographics (n= 87)	Number of patients
Gender	
Male	53 (61%)
Female	34 (39%)
Median age; range (years)	53 (24-79)
Median BMI; range (kg/m ²)	23.5; 15.5-41.3

Table 2. Location of the primary tumour.

Site of the tumor	Number
Rectum	52
Right colon	15
Left colon	8
Sigmoid colon	11
Synchronous carcinoma	1
Total	87

Table 3. Distribution of surgical procedures performed.

Type of procedure	No. of cases
Anterior resection	18
Low anterior resection	21
Right hemicolectomy	15
Left hemicolectomy	8
Sigmoid colectomy	11
Abdominoperineal resection	13
Total colectomy	1
Total	87

Table 4. Surgery-related complications.

Type of complication	No. of patients	Comment
Intraoperative		
Bowel injury	1	Presented as high output fistula
Early postoperative (<30 days)		
Anastomotic leak	2	Managed by proximal colostomy
Cardiac arrhythmias	3	
Intra-abdominal abscess	2	Ultrasound guided drainage
Wound infection	9	Wound drainage & antibiotics
Wound seroma	3	Wound drainage
Wound gaping	3	Secondary sutures for one case
Pneumonia	1	Conservative management
Ileus	3	Conservative management
Bleeding per rectum	1	Conservative management
Urinary retention	3	Intermittent catheterization
Late postoperative (>30 days)		
Intestinal obstruction	2	One re explored with resection
Sexual dysfunction	6	Two persistent erectile dysfunction
Fecal incontinence	1	Gradually improved

Table 5. Tumor characteristics according to histopathology.

Tumour characteristic	No. (%)
Histology	
Adenocarcinoma	87(100%)
Differentiation	
Well differentiated	9 (10%)
Moderately differentiated	74 (85%)
Poorly differentiated	4 (5%)
Duke Staging	
A	7 (8%)
B	20 (23%)
C1	45 (52%)
C2	15 (17%)
D	0

Table 6. Comparison between laparoscopic colonic versus rectal resections.

Item	Rectal resection	Colon resection
Number of cases	52	34
Operative time (median)	160 min.	95min.
Conversion	2 cases	1 case
Complications		
Wound infection	6	3
Wound gaping	2	1
Anastomotic leak	2	0
Sexual dysfunction	5	1
Fecal incontinence	1	0
Recurrence		
Port site	0	1
Local recurrence	2	0
Systemic recurrence	4	1

DISCUSSION

We found patients undergoing laparoscopic colorectal resection to have reasonable intraoperative blood loss, earlier return to normal oral intake, fewer postoperative complications, and fit for earlier hospital discharge. Although we recognize that our study involved only small numbers of patients, the findings provide encouraging support for both the clinical benefits and the cost savings associated with laparoscopic colorectal resection. The study findings complement existing evidence in the literature from both large single center studies and multicenter randomized controlled trials.

Our conversion rate of 3.5% is comparable to the published data, with reported conversion rates varying from 4% to 28%.⁽¹⁵⁾

The UK Medical Research Council (MRC) CLASICC (Short-term endpoints of conventional versus laparoscopic assisted surgery in patients with colorectal cancer) trial reports a median hospital stay of 9 days following laparoscopic resection, giving a stay reduction of 2 days compared with open surgery⁽¹⁶⁾ Similar results from the COLOR (COlOn cancer Laparoscopic or Open Resection) trial study group and from Leung et al. give mean stays of 8.2 days for laparoscopic surgery.^(17,18) All these studies however, report comparatively long postoperative stay following laparoscopic resection when compared to other research groups, who report median stays of 5 days following laparoscopic resection.^(19,20) Many of these studies, however, have

excluded patients undergoing rectal resection, a factor that may influence length of hospital stay and time to recovery.^(17,19,20) Our study included patients having either colon or rectal resection; indeed, the proportion of patients undergoing rectal resection was 60%. This may have implications with regard to operating time, morbidity, and postoperative stay. The median hospital stay of our study was 7.9 days which is more or less similar to reports of several studies. Many studies have found laparoscopic surgical resection to be associated with significantly longer operating times compared to the open equivalent.^(16,17,19) Lezoche et al. compared laparoscopic with open hemicolectomy in a prospective non-randomized study. Although they found laparoscopic surgery to take longer, they further stratified their results to compare operating times for the first 30 cases and the last 20 cases, and they found that as their laparoscopic experience increased, the operating times significantly was reduced, becoming closer to those of open resection.⁽²¹⁾

We found patients underwent laparoscopic resection were able to tolerate a normal oral intake in the early postoperative period. In the published randomized trials, earlier resumption of gastrointestinal function is a consistent feature following laparoscopic resection. Indeed, with earlier oral nutrition together with resolution of ileus have important implications in terms of a patient's fitness for discharge. In our study the mean time to resume oral intake was 3 days.

Blood loss and blood product requirement in

laparoscopic compared to open surgery is unclear, some studies reported reduced estimated blood loss^(17,22) and others suggested that the blood loss is comparable in both techniques.⁽²³⁾ In our study which analyses only laparoscopic resection the blood loss was minimal and accordingly the need for blood transfusion was minimal as well.

In cases of rectal cancer postoperative morbidity rates reported in the literature varied from 18 to 44%,⁽²⁴⁾ The most common complication is surgical wound infection, and it is around 10–15% for anterior resections and above 25% for abdominoperineal resections.⁽²⁵⁾ Some authors found a higher number of short- and long-term wound complications in laparoscopic surgery.⁽²⁶⁾ In our study, the auxiliary incision was protected by means of a plastic bag during specimen extraction and during intestinal anastomosis, Gloves, and instruments were changed for wound closure and the skin and subcutaneous tissue were washed out with 5% povidone-iodine solution. Perineal incisions were partially closed with a subcutaneous drain. In our study the percent of wound complications was 9.6% which is similar to the published reports.

Subgroup analysis comparing the results of both rectal and colon resection in our studied cases revealed that technical difficulties are more with rectal resections as compared to colon resection which was found less challenging and has more rapid learning curve as compared to rectal resection. Consequently the operative time and perioperative complications are encountered more with rectal resections.

In our study we found no technical difficulties in performing laparoscopic anterior resection for those received preoperative neoadjuvant radiotherapy as compared to those who did not. However no local recurrence was reported in those who received the neoadjuvant therapy as compared to the two cases of local recurrence reported in our series. The incidence of leakage was high in those received radiotherapy as compared to those who did not suggesting that there might be a role for the preoperative radiotherapy in increasing the incidence of leakage.

Sexual and Urinary bladder dysfunction are common complications of total mesorectal excision (TME) for rectal cancer. Despite serious efforts to preserve nerves during open TME, bladder and sexual dysfunction are reported to be in range of 0 to 12% and 10 to 35%, respectively.⁽²⁷⁾ Laparoscopic TME is believed to achieve better preservation of the pelvic nerve system because the magnified view of the pelvis under the laparoscope allows for easier identification of pelvic nerves.^(28,29) However, few studies on laparoscopic resection for rectal cancer evaluated its effect on genitourinary function. Jayne et al. provided the only RCT report of genitourinary function from the CLASICC trial's patients.⁽³⁰⁾ This report found no difference in the bladder function between the laparoscopic and open

groups (approximately 30% of patients reported moderate to severe symptoms in each group). More than 50% of male and female patients reported being sexually inactive in the questionnaires. In women, there was no difference in sexual function. In men, overall sexual function and erectile function tended to be worse after laparoscopic than open rectal surgery. TME is more commonly performed in the laparoscopic than open group for patients in the CLASICC trial, and the authors attributed this to the reason for the worse postoperative sexual function of men in the laparoscopic rectal group.⁽³¹⁻³³⁾ In our study the Urinary bladder and sexual dysfunction rates was 3.6% and 7.2 respectively. Because of the few relevant reports, it is difficult to comment on the effect of laparoscopic surgery on genitourinary function after rectal cancer surgery. More evidence is expected from ongoing trials comparing laparoscopic versus open rectal cancer surgery.

Although operating times are undoubtedly long during the initial laparoscopic learning curve, we have demonstrated that, with increasing operator experience, operating times became less. Equipment costs are greater for laparoscopic resection, although, these could be reduced by the use of non-disposable instruments. Despite the proportionately higher equipment costs, the improvements in clinical recovery and shorter hospitalization time make laparoscopic resection financially competitive when compared with open surgery. Proficiency in laparoscopic colorectal techniques requires adequate training and resources. However, the improvement in patient outcome seen in our laparoscopic patients, together with comparable operative time and overall cost, suggest justifiable endpoints for laparoscopic resection in both clinical and financial terms. Concerns regarding increased cost and long operating time should not therefore adversely influence the development of a laparoscopic colorectal practice.

In conclusions laparoscopic colorectal resection for colorectal carcinoma though technically demanding and a little costly, it was found to be technically feasible with few perioperative complications despite the little concern about port site recurrence and the adequacy of oncologic resection. However further studies on larger samples of patients are required for further evaluation.

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