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# A comparison of laparoscopic and conventional surgery for colorectal cancers: Evaluation of initial experience

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## ABSTRACT

**Introduction:** The aim of this study was to analyze initial experience with laparoscopic colorectal resection at 1 center and compare it with conventional open surgery.

**Materials and Methods:** In this retrospective, case-controlled study, prospective data of colorectal cancer patients was analyzed retrospectively. Fifteen laparoscopic (3 right, 6 left, and 6 rectal) and 15 open (3 right, 6 left, and 6 rectal) colorectal resections were analyzed with respect to patient demographics, pathological characteristics, and early postoperative complications.

**Results:** Mean operating time was longer in laparoscopic group (227±83.9 min vs. 174.6±54.7 min; p=0.077). Mean estimated blood loss was lower in laparoscopic group compared with open group (215.3±97 mL vs. 223.3±56 mL; p=0.500). In the laparoscopic group, number of lymph nodes and metastatic lymph nodes retrieved was higher than in open group (18±8.3 and 14.7±3.3, 1.1±2.1 and 0.8±1.3, respectively; p=0.243 and p=0.692). Overall early postoperative complication rate was 23.3%. Surgical site infection was seen in 6 patients (20%): 4 in the open surgery group, and 2 in the laparoscopic group. In 1 patient, after laparoscopic total mesorectal excision for rectal cancer, anastomotic leakage was seen and managed successfully with conservative methods.

**Conclusion:** Early results in laparoscopic colorectal surgery were comparable to open approach. Laparoscopic surgery for colorectal cancer is a feasible option, even in the surgeon's learning period.

**Keywords:** Colorectal cancer; laparoscopy; surgery.

## Introduction

Colorectal cancer is one the most common cancers worldwide. Appropriate surgical technique and sufficient lymphadenectomy are the most important goals to provide long-term, disease free, and overall survival. Although conventional open colectomy is still considered the gold standard for malign diseases, since the first laparoscopyas-

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sisted colectomy in the 1990s, laparoscopic colon resection has become a feasible option for colorectal cancer.[1] Beside the well-known advantages over conventional colectomy such as better cosmetics, less postoperative pain, rapid return of bowel function, short hospital stay and rapid return to work, significantly reduced thirty-day and three hundred sixty-five-day mortality rate have been presented in a recent, large study from the United Kingdom.[2] With the use of some specified protocol such as Enhanced recovery after surgery (ERAS), the advantage of less hospital stay could be increased.[3] In some studies, with less tissue damage, laparoscopic colorectal surgery has been found to be related to less oxidative stress and lower degree of inflammatory response than open surgery.[4,5] Moreover, its technical benefits have been suggested in obese patients.[6] In addition to short-term advantages, over time, comparable longterm oncological outcomes in laparoscopic colorectal and rectal surgery have been presented in some studies.[7–9] Despite growing experience inlaparoscopic surgery, laparoscopic colorectal resections are still technically demanding procedures. Inappropriate patient selection and delay in conversion to open technique may still lead to poor outcomes in inexperienced hands. In this retrospective casecontrolled study, it was aimed to analyze the initial experience of our center in laparoscopic colorectal resections and compare it with conventional open surgery.

## Materials and Methods

### Patients

The prospective data of colorectal cancer patients, who underwent curative intent colon or rectal cancer resection by one surgeon (Dr. R. A.) between October 2012 and April 2014 in Samsun Training and Research Hospital, Turkey, was analyzed retrospectively. In order to compare the outcomes, similar number of pathologically proven colorectal cancer patients were included into the study as a control group. Fifteen laparoscopic (3 right, 6 left, and 6 rectum) and fifteen open (3 right, 6 left, and 6 rectum) colorectal resections were analyzed for patient demographics, pathological characteristics, and early postoperative complications. The American Joint Committee on Cancer TNM staging system was used to assess the pathological stage of the tumors.

### Statistical Analysis

Continuous data were presented as median and range or mean ± standard deviation (SD). Dichotomous and categorical data were presented as numbers with percentages. Normally distributed continuous data were assessed with Student t-test. Unless the data were normally distributed, continuous data were assessed with Mann-Whitney U test. The Chi-square test was used for categorical data. A twotailed p value <0.05 was considered statistically significant. Statistical analyses were performed with the SPSS, version 16.00 (Chicago, IL, USA).

## Results

Age and sex were similar in the open and laparoscopic groups. Distribution of tumor location was totally similar in both groups. Demographic characteristics and tumor localization of the patients were presented in Table 1. Mean operating time was longer in the laparoscopic group (227±83.9 vs. 174.6±54.7 min) (p=0.077). On the other hand, mean estimated blood loss was lower in the laparoscopic group as compared with the open group (215.3±97 vs. 223.3±56 mL) (p=0.500). In the laparoscopic group, the drain was placed in all rectal cancer patients (n=6); while in the open surgery, it was placed in three of 6 rectal cancer

**Table 1. Demographic characteristics and tumor localization of the patients**

| | All patients (n=30) | Open colorectal surgery (n=15) | Laparoscopic colorectal surgery (n=15) | p |
|---|---|---|---|---|
| Age (mean±SD) | 64.1±15 | 65.9±16.5 | 62.3±13.6 | 0.521 |
| Sex, n (%) | | | | 0.999 |
| Male | 20 (66.7) | 10 (66.7) | 10 (66.7) | |
| Female | 10 (33.3) | 5 (33.3) | 5 (33.3) | |
| Location of the tumor, n (%) | | | | 0.999 |
| Right colon | 6 (20) | 3 (20) | 3 (20) | |
| Left colon | 12 (40) | 6 (40) | 6 (40) | |
| Rectum | 12 (40) | 6 (40) | 6 (40) | |

patients. Similarly, protective ileostomy was performed in all laparoscopic rectal resections; while in open surgery, it was performed in three patients. The mean drainage and median drain removal time were similar in laparoscopic and open groups (565±857 and 357.1±183.8; 6 (4–12) and 4 (4–25), respectively) (p=0.976 and 0.062). Operative characteristics of the patients were presented in Table 2.

In 3 (10%) of 30 patients less than twelve lymph nodes were retrieved, one in the open and two in the laparoscopic group. In the laparoscopic group, retrieved total and metastatic lymph node numbers were higher than in the open group (18±8.3 and 14.7±3.3; 1.1±2.1 and 0.8±1.3, respectively) (p=0.243 and 0.692). In all operation, oncologically acceptable negative margin was obtained. The dominant histopathologic diagnosis was adenocarcinoma [in the open group, 86.7% (13/15) and in the laparoscopic group, 80% (12/15)]. Pathological T and N category and TNM stage were similar between the groups; however, the sample size of the groups were small for an accurate statistical assessment. Pathological characteristics of the patients were presented in Table 3.

No intraoperative complication was seen in both groups. Overall early postoperative complication rate was 23.3%. In the open group, 4 (36%) of 15 patients experienced surgical site infection (SSI), while in the laparoscopic group, it was seen in 2 (16%) patients. In one patient, who underwent a laparoscopic total mesorectal excision (TME) for rectal cancer, anastomotic leakage was observed. In this patient, postoperative course was uneventful, except for controlled drainage. The reason of leakage was considered as lack of preoperative bowel preparation since hard stool on the proximal of the anastomosis was seen in the operation. The drain was observed and removed on the postoperative 25$^{th}$ day. Median length of hospital stay in the open and laparoscopic group was similar [7 (5–14) and 7 (4–26)] (p=0.397).

**Table 2. Operative characteristics of the patients**

| | All patients (n=30) | Open colorectal surgery (n=15) | Laparoscopic colorectal surgery (n=15) | p |
|---|---|---|---|---|
| Operating time (min), mean±SD | 200.8±74.5 | 227±83.9 | 174.6±54.7 | 0.77 |
| Blood loss (mL), mean±SD | 219.3±78.6 | 223.3±56 | 215.3±97 | 0.500 |
| Ileostomy, n (%) | 9 (30) | 3 (20) | 6 (40) | 0.427 |
| Drain, n (%) | 24 (80) | 14 (93.3) | 10 (66.7) | 0.169 |
| Drainage (mL), n (%) | 443.7±563.8 | 357.1±183.8 | 565±857 | 0.976 |
| Drain removal day, median (range) | 5 (4–25) | 4 (4–25) | 6 (4–12) | 0.062 |

**Table 3. Pathological characteristics of the patients**

| | All patients (n=30) | Open colorectal surgery (n=15) | Laparoscopic colorectal surgery (n=15) | p |
|---|---|---|---|---|
| Tumor type, n (%) | | | | |
| Adenocarcinoma | 25 (83.3) | 13 (86.7) | 12 (80) | 0.999 |
| Others | 5 (16.7) | 2 (13.3) | 3 (20) | |
| Harvested lymph nodes, mean±SD | 16.3±6.4 | 14.7±3.3 | 18±8.3 | 0.243 |
| Metastatic lymph nodes, mean±SD | 1±1.7 | 0.8±1.3 | 1.1±2.1 | 0.692 |
| TNM stage, n (%) | | | | |
| 0 | 4 (13.3) | 1 (6.7) | 3 (20) | 0.710 |
| 1 | 5 (16.7) | 2 (13.3) | 3 (20) | |
| 2A | 11 (36.7) | 6 (40) | 5 (33.3) | |
| 3A | 1 (3.3) | 1 (6.7) | – | |
| 3B | 8 (26.7) | 5 (33.3) | 3 (20) | |
| 4A | 1 (3.3) | – | 1 (6.7) | |

## Discussion

In this study, it was aimed to investigate our initial experience with laparoscopic and open colorectal resections and show the difference between pathological assessments of the two approach. The feasibility of laparoscopic colorectal surgery has been proved in large-volume randomized controlled clinical studies. In COST (Clinical Outcomes of Surgical Therapy) study, the outcome of eight hundred and seventy-two patients with colon cancer have been randomized into laparoscopy and open groups.[10] Laparoscopy has been suggested to be related with longer operation and quicker recovery times. Furthermore, no significant difference in morbidity, mortality, and recurrence or survival has been revealed, and concluded that laparoscopy is safe in cancer patients. This level of evidence to perform laparoscopic colon resections has been reported in other randomized trials. In the COLOR (Colon Cancer Laparoscopic or Open Resection) trial, one thousand two hundred and forty-eight patients with colon cancer have been randomized in open and laparoscopy group.[11] Laparoscopic resection group has had longer operating times but less blood loss, earlier recovery of bowel function, less postoperative pain, and shorter length of hospital stay. There has been no difference in the extent of resection or early morbidity and mortality. The authors have concluded that laparoscopic surgery can be used for safe and radical resection of colon cancer. In the MRC CLASICC (Conventional vs. Laparoscopic- Assisted Surgery in Colorectal Cancer) trial, rectal cancer patients have been included into a randomized trial for the first time.[12] A 29% conversion rate has been reported. In patients with conversion, complication rates have been slightly higher. Additionally, statistically insignificant higher incidence of postoperative circumferential resection margin after laparoscopic anterior resections was suggested. There has been no difference in hospital mortality or quality of life in the early postoperative period. The authors have deduced that laparoscopic resection for colon cancer is a feasible and effective option to open surgery; however, impaired short-term outcomes after laparoscopic resection for rectal cancer should be evaluated before its routine use. Considering long-term outcomes, the 3-year follow-up results for the UK MRC CLASICC Trial Group have shown no difference between the open and laparoscopic groups in the 3-year overall survival, diseasefree survival or local recurrence.[13] Higher positivity of the circumferential resection margin after laparoscopic anterior resection has not led to an increased incidence of local recurrence. There has been no difference in the quality of life. The authors have concluded that long-term outcomes for patients with rectal cancer are similar in those undergoing open surgery and supported the continued use of laparoscopic surgery. However, Brown et al. have shown adverse effects in long-term quality of life in patients with postoperative complications.[14] From this aspect, it has come to our attention that short-term outcomes of laparoscopic colorectal surgery are probably better from open surgery, but the outcomes of patients with conversion are less favorable. Designed as a case-controlled study, same number of patients in both groups were included into the study. In agreement with previous studies, our laparoscopic resection operation times were higher than open resection; however, it was not statistically significant. Moreover, our blood loss showed a similar decrease, but this difference did not reach a statistical significance.

In the pathological assessment of the resected specimens, there was no difference in terms of histological type of cancers, harvested lymph nodes number, harvested metastatic lymph node numbers, and TNM stage of the tumors. Our results, with such limited experience, showed a similarity with previous reports. However, longer hospital stay in the laparoscopic resection group was observed. This finding was based on one patient's eventful postoperative period. In this patient, who underwent a laparoscopic total mesorectal excision (TME) for rectal cancer, anastomotic leakage was seen. Although mechanical bowel preparation was not found to be an effective strategy for the prevention of anastomotic leakage, specifically in this patient, since hard stool on the proximal of the anastomosis was seen in the operation, leakage was considered to be related with lack of bowel preparation.[15] Other anastomotic leakage risk factors such as increased blood loss and fecal contamination were not present in the patient.[16] The postoperative course of the patient was uneventful, except for controlled drainage. The drain was observed and removed on the postoperative 25$^{th}$ day. Anastomotic leak rate in this study was 3.3%. Despite the small sample size, our rate was not high in reference to previous reports.[17,18] Regarding previous report, our SSI rate was higher, but small sample size of our study makes it difficult to explain this results.[19,20] It should be noted that we did not experience any conversion to open surgery.

Our study had some weak points. First of all, our sample size was too small for an accurate conclusion on the difference of laparoscopic colorectal surgery and the study

was designed in retrospective nature. However, the feasibility of our initial experience was aimed to be shown. Secondly, our patients were not homogenous in terms of tumor localizationand TNM stage. Thirdly, we could not follow-up our patients properly, and reported only early operative results. For the feasibility of performing laparoscopic oncologic operations, long-term results must be obtained.

In this case-controlled retrospective study, no difference was shown in laparoscopic and open resections for colon and rectum cancer. Laparoscopic colorectal surgery is safe, even in the learning period. Our long term results should be observed and discussed to clarify our sufficiency in the oncologic management of colorectal cancer patients.

These results demonstrated that laparoscopic colectomy for colorectal cancer was feasible for our center with acceptable additional operative times and significant intraoperative bleeding control. Overall surgical and oncological outcomes were not worse than our open colectomy experience.

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