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Original Article

The impact of previous open abdominal surgery on the outcome of laparoscopic colorectal surgery

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Abstract

Aim: Although the laparoscopic approach is increasingly being used in colorectal surgery, it is anticipated that the technical problems caused by previous abdominal open surgery (PAOS) will adversely affect the outcomes. The aim of this study was to evaluate the outcomes of previous abdominal surgery in patients with colorectal cancer who underwent laparoscopic surgery for treatment.

Material and Methods: Among the patients who underwent laparoscopic surgery for colorectal cancer between January 2015 and December 2018, those who had a history of previous abdominal surgery and those who did not were compared. Those with a history of laparoscopic abdominal surgery are not included in the PAOS group and short-term postoperative complications, conversion to open surgery, reoperations, hospital readmissions, and mortality rates were analyzed between the groups.

Results: 21 of 140 patients who underwent laparoscopic surgery for colorectal cancer had PAOS. The groups with and without PAOS were similar in terms of age, sex, body mass index, ASA score, and comorbid disease. No difference was observed regarding conversion to open surgery ($p = 0.513$), postoperative complications ($p > 0.05$), reoperations ($p = 0.162$), unplanned hospital readmissions ($p = 0.154$), and perioperative mortality ($p = 0.136$) between the two groups.

Conclusion: We believe that laparoscopy can be safely performed in patients with colorectal cancer who had previous abdominal open surgery with similar clinical and postoperative complication rates as in patients without a history of PAOS.

Keywords: Adhesions; colon cancer; laparoscopic surgery; postoperative complications; rectal cancer

INTRODUCTION

Since 1991, when laparoscopic colorectal resection was first performed, the laparoscopic approach has been increasingly performed in colorectal surgery (1). Previous randomized controlled clinical trials have demonstrated laparoscopic surgery to be safe and feasible in terms of oncological outcomes in colorectal cancer patients. (2-9).

However, it is predicted that technical problems caused by previous abdominal open surgery (PAOS) will adversely affect the outcomes. As a matter of fact, laparoscopic procedures had been once considered a contraindication because of the thought that they may cause bleeding, organ damage, and intestinal injury due to intraoperative adhesions that may occur during the previous abdominal surgery also There are many contraindications in the literature for laparoscopic colorectal surgery such as large tumors, invasion to surrounding tissues, emergency cases (perforation, obstruction) (6-10).

The main factors that can make these operations difficult and cause surgeons to hesitate to perform a laparoscopic procedure include risk of vascular or intestinal injury during port placement, the difficulty of obtaining adequate pneumoperitoneum, and difficulty in exploration due to previous abdominal surgeries (11-13).

In previous studies, postoperative recovery time, postoperative hospital stays, perioperative mortality and morbidity rate, the number of lymph nodes dissected, the positivity rate of peripheral resection margin, overall survival rate, and 3-year disease-free survival were reported to be similar between the two groups, whereas it was reported that the operation duration was statistically significantly longer and the rate of conversion to open surgery was higher in the patient group who had prior abdominal open surgery (10,14). However, there is still controversy over the use of laparoscopy during colorectal surgery in patients with a prior history of abdominal surgery (11,15).

In this study, it was aimed to evaluate the effect of previous abdominal open surgery in patients who underwent laparoscopic surgery for the treatment of colorectal cancer by comparing it with patients without previous abdominal open surgery.

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MATERIALS and METHODS

Patient population

There were 344 patients who underwent surgery due to colorectal cancer between January 2015 and December 2018, Patients under palliative surgery, patients with metastatic disease, under the age of eighteen, pregnant patients, patients whose records could not be reached were excluded from the study. Of the remaining patients. 140 patients who underwent laparoscopic surgery were retrospectively analyzed. We divided the patients into two groups: those who had abdominal open surgery (Group 1:21) and those who did not have abdominal open surgery (Group 2:119). Those with a history of laparoscopic abdominal surgery and those who had minor abdominal surgery were not included in the PAOS group.

Patients were compared regarding demographic characteristics, body mass index (BMI), American Anesthesiology Association score (ASA) scores, comorbid diseases, tumor localization, rates of conversion to open surgery, intraoperative complication rates, postoperative complication rates, duration of surgery, postoperative hospitalization time, number of reoperations, unplanned hospital readmission, and perioperative mortality.

Definitions

PAOS was defined as any abdominal surgical procedure involving the peritoneal cavity. Patients who had major PAOS according to the classification recommended by Kim et al. were included in the study (16). Major PAOS was defined as abdominal surgery involving multiple abdominal quadrants, which are accessed via a midline incision from the xiphoid to the umbilicus, or from the umbilicus to the symphysis pubis.As previously described, the definition of conversion to open surgery was the use of any incision made for anything other than sample extraction or port placement. The extracorporeal anastomosis was not considered a conversion to open surgery (17). Wound infection was defined, based on the definition of the United States Center for Disease Control and Prevention (CDC) (18). Perioperative mortality was defined as death occurring within the 30 days after surgery or during the hospital stay

Operation technique

All operations were performed by surgeons with colorectal laparoscopic experience. All patients received deep vein thrombosis prophylaxis and prophylactic antibiotherapy. Patients underwent standard bowel cleansing. Multiport techniques were used for all patients. The first entry into the peritoneal cavity was routinely established via the umbilicus using an open technique. In the presence of a previous midline incision with a significant scar on the wound, first access was provided in an area away from the scar using the open technique. In most cases, four trocars were used, additional trocars were placed if necessary. Intestinal mobilization, vascular division, sealing, and lymphadenectomy were performed laparoscopically. Intestinal transection and anastomosis were performed intracorporeally or extracorporeally according to different surgical procedures. The specimen was removed using the wound protector.

Postoperative follow-up

The criteria for discharge were specified to be meal tolerance without nausea or vomiting, adequate pain control with oral analgesia, defecation or stoma function, and independent mobilization.

Statistical Analysis

SPSS 24.0 package program was used for the statistical analysis of the data. Numbers and percentages were used to summarize categorical data, while mean and standard deviation was used to summarize continuous measurements (median and minimum-maximum, where necessary). Pearson Chi-square test was used to compare categorical variables. For comparisons of the continuous measurements between the groups, the distributions were controlled, for the parameters with normal distribution, independent student t-test was used, and Mann Whitney U test was used for the parameters without normal distribution. The significance level was taken as 0.05 for all tests.

RESULTS

Twenty-one of 140 patients who underwent laparoscopic surgery for the treatment of colorectal cancer had major PAOS (Table 1).

Groups with and without PAOS were similar in terms of age (p : 0.588), sex (p : 0.456), body mass index (p : 0.799), ASA score (p : 0.191), tumor localization (p : 0.33) (p : 0.33) (Table 1).

The most common comorbid disease is hypertension. Comorbid diseases are shown in (Table 2).

In 2 patients, conversion to open surgery occurred (9.5%) in the PAOS group (Group 1) and in 15 patients (12.6%) in the non-PAOS group (Group 2) (p : 0.513). While no intraoperative complication was observed in any patient in Group 1, it was observed in 3 (2.5%) patients in Group 2 (p: 0.612). The duration of surgery was longer in Group 1 (178.99 minutes vs 168.57 minutes, p = 0.199). It is shown in (Table 3).

Postoperative hospitalization time was similar in the groups (8.0 vs 7.24 p : 0.450). In Group 1, the most common complication was wound infection (19%), which was seen in 4 patients, whereas in Group 2, the most common complication was ileus (16%). There was no statistical difference between postoperative complications (Table 4).Reoperation was required in four patients in Group 1 (19%) and five patients in Group 2 (4.2%) (p : 0.162). Unplanned hospital readmissions (p : 0.154) and perioperative mortality (p : 0.136) were similar in the groups (Table 5).

Table 1. Demographic and clinical characteristics, Previous surgery causes

Parameter	Group 1 (n=21) n (%)	Group 2 (n=119) n (%)	p
Age	60.29+14.8 (37-83)	58.61+12.6 (23-97)	0.588
Female sex	6 (28.5)	39 (32.7)	0.456
BMI	26.84+3.8 (19-35)	26.57+4.6 (18-50.07)	0.799
ASA score			
1	8 (38)	69 (57.9)	0.119
2	8 (38)	38 (31.9)	
3-4	5 (23.8)	12 (10)	
Tumor localization			
Right	5 (23.8)	15 (12.9)	0.330
Left	4 (19)	35 (30.2)	
Rectum	12 (57.1)	66 (56.9)	
		n	
Previous surgery causes	Total abdominal hysterectomy	6	
	Acute abdomen (Peptic ulcer perforation)	3	
	Acute abdominal trauma	3	
	Acute abdomen (perforated appendicitis)	2	
	Acute abdomen (hemorrhagic cyst rupture)	2	
	Gallbladder surgery (with midline)	2	
	Acute abdomen (small intestine resection)	1	
	Endometriosis	1	
	Sharp object injury	1	

ASA- American Anesthesiology Association score BMI-body mass index Values are presented as mean ± SD (Min-Max)

Table 2. Comorbid diseases

Parameter	Group 1 (n=21) n (%)	Group 2 (n=119) n (%)	p
HT	8(38)	38 (31.9)	0.374
DM	2(9.5)	23(19.3)	0.227
CAD	4(19)	15(12.6)	0.310
CHF	1(4.8)	2(1.7)	0.388
COPD	2(9.5)	8(6.7)	0.460

HT-Hypertension, DM-diabetes mellitus, CAD-coroner artery disease, CHF- congestive heart failure, COPD- chronic obstructive pulmonary disease

Table 3. Reasons for conversion to open surgery and intraoperative parameters

Parameter	Group 1 (n=21) n (%)	Group 2 (n=119) n (%)	p
Conversion to open surgery	2(9.5)	15 (12.6)	0.513
Reasons for conversion			
Exploration difficulty	1(4.8)	3(2.52)	
Adhesions	1(4.8)	1(0.8)	
T4 tumor	0	2(1.7)	
Organ injury	0	2(1.7)	
Bleeding	0	2(1.7)	
Dilated bowel loops	0	2(1.7)	
Surgical margin proximity	0	1(0.8)	
Perforation	0	1(0.8)	
Anastomosis complications	0	1(0.8)	
Intraoperative complication	0	3 (2.52)	0.612
Duration of surgery	178.99+35.2 (90-300)	168.57+26.2 (120-220)	0.199

Values are presented as mean ± SD (Min-Max)

Table 4. Postoperative hospitalization time and complications

Parameter	Group 1 (n=21) n (%)	Group 2 (n=119) n (%)	p
Postoperative hospitalization time (days)	8.0+4.8 (4-20)	7.24+3.9 (1-23)	0.450
Postoperative complication			
Wound site infection	4(19)	9(7.6)	0.513
Intra-abdominal abscess	2(9.5)	2(1.7)	0.107
Evisceration	2(9.5)	1(0.8)	0.059
Ileus	2(9.5)	19(16)	0.352
Anastomotic leak	2(9.5)	3(2.5)	0.146

Values are presented as mean ± SD (Min-Max)

Table 5. Postoperative outcomes

Parameter	Group 1 (n=21) n (%)	Group 2 (n=119) n (%)	p
Reoperation			
Anastomotic leak	2(9.5)	3(2.5)	0.162
Evisceration	1(4.8)	1(0.8)	
Ileus	1(4.8)	1(0.8)	
Unplanned hospital readmission			
Ileus	0(0)	15(12.6)	0.154
General condition disorder	5(23.8)	6(5)	
Wound site infection	1(4.8)	3(2.52)	
Anastomotic leak	1(4.8)	5 (4.2)	
Deep vein thrombosis	0	1(0.8)	
Perioperative mortality	4(19)	10(8.4)	0.136

DISCUSSION

The relationship of previous abdominal surgery with laparoscopic colorectal procedures has not been fully clarified yet (19-21).

In the literature, some studies have reported positive outcomes to support laparoscopic colorectal surgery in patients with a history of previous abdominal surgery, while some studies have published negative outcomes. In some studies, no significant difference regarding intraoperative blood loss, the duration of surgery, the rate of conversion to open surgery, time to the start of bowel movements, and duration of hospital stay was reported (21,22). However, other studies have also found that the rate of conversion to open surgery was significantly higher in patients with previous abdominal surgery (17,20).

While obesity, pregnancy, cirrhosis, and previous abdominal surgery have been considered as definite contraindications for laparoscopic surgery in the past, most of the contraindications which had been previously considered absolute contraindication became a relative contraindication today, with advances in surgical devices and increased experience and knowledge of surgeons about performing complex procedures such as colorectal surgery (23-25).

After abdominal surgery, postoperative adhesions may occur in up to 90% of the patients (13.) These postoperative adhesions can affect laparoscopic interventions in many ways. Compared to the Verres technique, it has been reported that the Hasson technique significantly reduces the incidence of vascular and visceral injuries (26). In our series, insufflation was performed using open technique. The risk of intestinal and vascular injuries may increase during the placement of laparoscopic ports. It may not be possible to place the ports in the normal area due to scarring and potential underlying lesions. Adhesions due to previous abdominal surgery can disrupt normal anatomy and make exploration difficult. Also, the release of these adhesions to provide access to the surgery area extends the duration of surgery and brings additional morbidity to the patient. (19)

Laparoscopic adhesiolysis is reported to have an association with an incidence of intraoperative bowel injury, ranging from 3% to 17.6% (27). Van der Krabben et al reported increased postoperative complication rates, increased rates of follow-up in the intensive care unit, and prolonged hospitalization due to complications that may occur during the release of adhesions in patients with previous abdominal surgery (27). Another study reported that the risk of intestinal injury increased in the group with a history of abdominal surgery (28).

No vascular injury and bowel perforation were observed during the release of adhesions in our series.

In the literature, the rate of conversion from laparoscopic to open surgery was reported to vary between 5.2% and 26.1% in patients with a history of abdominal surgery (24,29). Aytaç E et al. found the rate of conversion to open surgery due to adhesions as 10% in patients who were converted to open surgery in their study (11). In a study of Maggiori where incisions were compared, it was reported that there was a higher rate of conversion in midline incisions, which may have been due to difficulty in placing the port in the midline adhesion (19).

Different results in this series varied based on the nature of the abdominal surgery. In his study, Tekkis reported that the rates of conversion to open surgery depend on many factors, including BMI, ASA scores, presence of abscess or fistula, and resection type (30).

In our series, the rates of conversion to open surgery of 9.5% 12.6% p :0.513 did not make a statistical difference. In our series, 2 patients in the PAOS group were converted to open surgery due to adhesions and difficulty in exploration. The accepted recommendations in the literature for converted to open surgery were also valid for our study.

Difficulties in placing the ports and laparoscopic release of adhesions in patients with a history of abdominal surgery prolong the duration of surgery. While Vignali et al. found the duration of surgery to be longer in the group with PAOS in their series (20), some other studies reported that the difference in terms of duration of surgery was not statistically significant (21,31,32). In our series, the operation times were 178 minutes in the group with PAOS and 168 minutes in the group without PAOS and there was no statistically significant difference between the two groups.

In patients with a history of abdominal surgery, the rate of postoperative complications has been reported to vary between 10% and 39.1% in the literature (15,20,25) Ileus, surgical site infections, and anastomotic leak were the most common postoperative complications. The most common complications were reported to be wound infections, postoperative ileus, and anastomotic leak in the study conducted by Kamer where the morbidity rate was found to be 23.5% (25). While this rate was 57% in patients who underwent open abdominal surgery in our series, it was 28.6% in patients without previous abdominal surgery. Wound infection was the most common postoperative complication by 19%. Anastomotic leak was identified in 2 (9.5%) patients in Group 1 and 3 (2.5%) patients in Group 2; these patients were re-operated; reanastomosis or stoma was performed based on their clinical pictures. Our high morbidity rate was associated with our wound infection rates.

When examined in terms of hospital readmissions and reoperations, Franko et al reported that unplanned hospital readmission and reoperation rates were seen to be higher in patients with a history of abdominal surgery in the series of 1000 patients (32).

In our study, the reoperation rates were similar between the groups and the causes of reoperation included anastomotic leak and evisceration. Our hospital readmission rate was found to be higher in the group with

a previous abdominal surgery history. The most common cause was ileus (12.6%). In the group with a history of abdominal surgery, although the rates of reoperation and unplanned hospital readmission were higher in percent, they were not statistically significant.

The fact that our study was retrospective, has a small cohort, and minor surgical interventions constitute the majority of previous surgery were the limitations of our study.

CONCLUSION

We concluded that laparoscopy can be safely performed in patients with colorectal cancer on selected patients who had undergone open abdominal surgery with similar clinical and postoperative complication rates as in patients without a history of PAOS.

Competing Interests: The authors declare that they have no competing interest.

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Ethical Approval: This study was approved by local ethics committee (Cukurova University, Clinical Researchs Ethics Committe. Number: 2021/114.

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