



# Our Experience of Laparoscopic Colorectal Surgery: Short Term Outcomes

## Laparoskopik Kolorektal Cerrahi Deneyimimiz: Kısa Dönem Sonuçlarımız

Eyüp Murat Yılmaz<sup>1</sup>, Erdem Barış Cartı<sup>1</sup>, Altay Kandemir<sup>2</sup>

<sup>1</sup>Adnan Menderes University Faculty of Medicine, Department of General Surgery, Aydın, Turkey

<sup>2</sup>Adnan Menderes University Faculty of Medicine, Department of Internal Medicine, Division of Gastroenterology, Aydın, Turkey

### ABSTRACT

**Aim:** Currently laparoscopic colorectal surgery began to be a widely used procedure in many centers. We aimed to present early period outcomes of first group of patients who had laparoscopic colorectal surgery in our clinic.

**Method:** Included were 30 patients who underwent laparoscopic colorectal surgery between September 2014 and August 2016 in Adnan Menderes University Faculty of Medicine General Surgery Clinic.

**Results:** A total of 30 patients were included to this study. Low anterior resection were performed in 11 (36.7%) patients, right colectomy in 10 (33.3%) patients, anterior resection in seven (23.3%) patients, total colectomy in one (3.3%) patient, abdominal perineal resection in one (3.3%) patient. Median operation time was 149.67 (range, 100-300) minutes. The median postoperative length of stay was 6.87 (range, 3-34) days. Anastomotic leakage occurred in two patients (6.7%), ureter damage in one patient (3.3%), and wound infection in five patients (16.7%).

**Conclusion:** Our laparoscopic colorectal surgery outcomes and the literature shows similarity.

**Keywords:** Laparoscopy, colorectal surgery, experience

### ÖZ

**Amaç:** Laparoskopik kolorektal cerrahi günümüzde birçok merkezde yaygın olarak kullanılan bir prosedür halini almaya başlamıştır. Kliniğimizdeki ilk laparoskopik kolorektal cerrahi olgularımızın erken dönem sonuçlarını sunmayı planladık.

**Yöntem:** Eylül 2014-Ağustos 2016 tarihleri arasında Adnan Menderes Üniversitesi Tıp Fakültesi, Genel Cerrahi Anabilim Dalı Kliniği'nde laparoskopik kolorektal cerrahi uygulanan olgular çalışmaya dahil edilmiştir.

**Bulgular:** Çalışmamıza toplam 30 hasta dahil edildi. On bir olguya (%36,7) Low anterior rezeksiyon, 10 olguya (%33,3) sağ kolektomi, yedi olguya (%23,3) anterior rezeksiyon, bir olguya (%3,3) total kolektomi, bir olguya da (%3,3) abdominoperineal rezeksiyon işlemi uygulandı. Ortalama ameliyat süresi 149,67 dakika (aralık, 100-300) olarak kaydedildi. Hastaların ortalama hastanede yatış süreleri 6,87 gün (aralık, 3-34) olarak belirlendi. Toplam iki hastada (%6,7) anastomoz kaçağı gelişirken, bir hastada (%3,3) üreter hasarı, beş hastada (%16,7) yara yeri enfeksiyonu gelişti.

**Sonuç:** Laparoskopik kolorektal cerrahi sonuçlarımız literatür ile benzer sonuçlar vermektedir.

**Anahtar Kelimeler:** Laparoskopik, kolorektal cerrahi, deneyim

## Introduction

Today, minimal invasive intervention in colorectal surgery has become widespread all over the world and begun to be used quite frequently in many centers.<sup>1</sup> It is a safe procedure with numerous significant advantages over open surgery such as shorter hospital stay, postoperative earlier recovery, better cosmetic outcomes, lower need for analgesics, and

earlier normalization of gastrointestinal system functions.<sup>2</sup> Laparoscopy was first used in 1950s as a diagnostic method and then in early 1990s, it has begun to be used in colon surgery.<sup>3</sup> Although it is currently being widely used, laparoscopic colon resection from the right colon to the rectum is not superior to the robotic surgery in terms of surgical margin, lymph node dissection and surgery duration,



Address for Correspondence/Yazışma Adresi: Eyüp Murat Yılmaz MD  
Adnan Menderes University Faculty of Medicine, Department of General Surgery, Aydın, Turkey  
Phone: +90 505 600 59 95 E-mail: drmyilmaz80@gmail.com  
Received/Geliş Tarihi: 29.08.2016 Accepted/Kabul Tarihi: 19.09.2016

but is considered less expensive than robotic surgery in terms of cost. However, there are authors defending that robotic surgery is more comfortable and advantageous than laparoscopic surgery for rectum because of narrow pelvis.<sup>4</sup> Laparoscopic surgery has higher cost as compared to the open surgery, but significant advantages have been reported such as shorter hospital stay, lower postoperative pain and shorter recovery period leading to better wound healing and early start of adjuvant therapy in oncological patients.<sup>1,5</sup>

Currently, laparoscopic method has not been regarded as the gold standard in colorectal surgery yet. Nevertheless, it has been suggested as an alternative to the open surgery in numerous researches although it has been described by some surgeons as “hand-help” surgery because of the incision made to remove the specimen.<sup>6</sup> In the present paper, we planned to report the first cases that underwent laparoscopic surgery in our clinic.

## Materials and Methods

Cases that underwent laparoscopic colorectal surgery between September 2014 and August 2016 in the Adnan Menderes University Faculty of Medicine, Department of General Surgery were included in the study. Medical records were retrospectively reviewed. Demographic characteristics and diagnoses of the patients, localization, diameter and stage of the tumor, type and duration of surgery, number of the lymph nodes removed, duration of hospital stay, time to start on liquid diet, time to start on regular diet, and the complications were recorded. The cases, in which the procedure was started as laparoscopic surgery but then switched to the open surgery, were excluded. All patients were informed about the surgical procedure and the potential complications and their written consents were obtained. All patients received liquid diet one day prior to the surgery and underwent appropriate intestinal cleaning together with prophylactic antibiotic and prophylaxis for deep venous thrombosis. All procedures were performed by the same surgical team. Pneumoperitoneum was established using carbon dioxide at an insufflation pressure of 12-14 mmHg. The number of trocars and the insertion sites varied depending on the procedure (Figure 1, 2). For the right colectomy, approximately 4-5 cm incisions were made both under and above the umbilicus; the wound protector was placed into these sites and the specimen was removed out of the abdomen through these sites and anastomosis was performed by stapler out of the abdomen. Stapler patency was closed with stapler again and anastomosis was completed. For the left colon and rectum surgeries, 4-5 cm phannelstein incision was made and the specimen was removed through this incision site. Subsequently, anvil was placed into the proximal loop and anastomosis



Figure 1. Trocar and incision sites in laparoscopic right colectomy



Figure 2. Trocar and incision sites in laparoscopic low anterior resection

was performed inside. In a single case of abdominoperineal resection (APR), the specimen was removed through the anal canal. Total colectomy was performed in a case with familial adenomatous polyposis coli and the specimen was removed through the phannelstein incision. Protective loop ileostomy was performed in the cases with tumor located in the lower rectum than 8 cm and with the risk of anastomosis. Liquid diet was given to the patients on the postoperative day 1 or 2 depending on the patient's general status and safety of anastomosis. On the following days, the diet was gradually increased based on gas and stool passage; the patients were discharged from the hospital with healing; and early complications were recorded.

### Statistical Analysis

SPSS 20 (IBM Corp. Released 2011. IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp.) statistical package program was used for data analysis. Variables were presented as mean  $\pm$  standard deviation, median (minimum-maximum), percentage and frequency.

### Results

A total of 30 patients were enrolled in the study. Of the patients, 18 (60%) were male, 12 (40%) were female, and the mean age was 64.5 (45-81) years. Eleven cases (36.7%) underwent low anterior resection (LAR), 10 cases (33.3%) underwent right colectomy, seven cases (23.3%) underwent anterior resection, one case (3.3%) underwent total colectomy, and another case (3.3%) underwent APR. The entire study group consisted of malignancy patients (100%). The mean tumor diameter was 4.43 cm (2-8.70). According to the TNM staging, three (10%) were stage 1, 13 (43.3%) were stage 2, 13 (43.3%) were stage 3, and one (3.3%) was stage 4 patient. The mean number of lymph nodes removed at dissection was 16.53 (8-34). With regard to the surgical methods, the mean number of lymph nodes removed at dissection was 16.1 (8-24) in LAR, 20.8 (14-34) in right colectomy, 17.4 (14-29) in AR, 13 in total colectomy, and 12 in APR. The mean surgery duration was 149.67 (100-300) minutes. The mean duration of hospital stay was 6.87 (3-34) days. The mean time to start on liquid diet was 1.3 (1-3) days and the mean time to start on regular diet was 2.8 (2-8) days. While a total of two patients (6.7%) developed anastomosis leakage, one patient (3.3%) had full-thickness cut through the ureteral wall, and 5 patients (16.7%) developed wound-site infection. Mortality occurred in none of the cases. Stoma was opened for anastomosis leakage. Full-thickness cut through the ureteral wall was repaired by placing percutaneous nephrostomy catheter and then performing ureteroureterostomy anastomosis over the double-j catheter by a team of urologists approximately

after two months. Wound site infection was brought under control with oral antibiotic therapy (Table 1, 2).

### Discussion

Although advanced laparoscopic surgery is currently being used safely for various procedures in many centers, it has not considered as the gold standard in colorectal surgery yet.<sup>6,7</sup> However, it is advantageous over open surgery in many aspects including cosmetic appearance, early recovery, less frequent postoperative pain, lower rate of wound site infection, and lower rate of incisional hernia.<sup>8,9</sup> Adequate number of lymph nodes removed at dissection and the tumor-free biopsy margin and radial margin are the most critical criteria accepted currently for survival in malignancy cases.<sup>10</sup> Comparing these two procedures in terms of oncological principles, none of them is superior to the other.<sup>5,10</sup> Gupta and Watson<sup>11</sup> compared laparoscopic colorectal surgery with open colorectal surgery and demonstrated that laparoscopic colorectal surgery less frequently causes trauma-induced immune system injury and immune dysfunction. Many studies in the literature report the incidence of complications to be 1.5-36% in laparoscopic colorectal surgery.<sup>12,13</sup> The present study as well is in line with the literature. Major complications such as anastomosis leakage and full-thickness cut through the ureteral wall were encountered in 10% of

Table 1. Types of surgery, tumor stages, and complications

		n	Range (%)
Gender	Female	12	40.0
	Male	18	60.0
Surgery	APR	1	3.3
	AR	7	23.3
	LAR	11	36.7
	Right colectomy	10	33.3
	Total	1	3.3
Stage	1.00	3	10.0
	2.00	13	43.3
	3.00	13	43.3
	4.00	1	3.3
	Total	30	100.0
Complication	Anastomosis leakage	2	6.7
	Full-thickness cut through the ureteral wall	1	3.3
	Wound site infection	5	16.7
	None	22	73.3

APR: Abdominoperineal resection, LAR: Low anterior resection

Table 2. Tumor and patient data

	n	Minimum	Maximum	Mean	Standard deviation
Age	30	45.00	81.00	64.50	8.96
Duration (min)	30	100.00	300.00	149.67	39.21
Hospital stay (day)	30	3.00	34.00	6.87	6.09
Lymph node	30	8.00	34.00	16.53	5.37
Tumor diameter (cm)	30	2.00	8.70	4.43	2.01
Time to start on liquid diet (day)	30	1.00	3.00	1.30	0.53
Time to start on regular diet (day)	30	2.00	8.00	2.80	1.19

study population. Full-thickness cut through the ureteral wall occurred in the second case of our learning curve, and no iatrogenic ureteral injury occurred thereafter. It is conspicuous that anastomosis leakage was encountered in two cases that underwent right colectomy procedure but not in the cases that underwent left colon and rectum surgeries. We think that protective ileostomy in rectum surgeries prevents leakage. In the right colectomy procedure, proximal ileal loop and distal transverse colon were removed out of the abdomen through the mini laparotomy incision and the anastomosis was completed using two linear staplers without reinforcing Lambert sutures. Because of high anastomosis leakage rate as 20% in the right hemicolectomy cases, we decided to perform manual anastomosis (Connell suturing by 3/0 vicryl in the first line and then Lambert suturing by 3/0 vicryl in the second line), in which we have gained experience during open surgeries, or to use reinforcing sutures by 3/0 vicryl in the future ileotransversostomy anastomoses where we use two linear staplers.

We think that mean surgery duration is shortened with increasing experience on laparoscopy. In the literature, there are studies reporting that nearly 20-30 procedures are required for a surgeon to be considered experienced.<sup>3,14</sup> Gilmore et al.<sup>15</sup> reported the mean surgery duration as 156 minutes, which was 149.67 minutes in the present study. We observed that the surgery duration, which was longer than 200 minutes in the first 10 cases, have decreased gradually. For this reason, we think that advanced laparoscopy performed carefully and persistently in every surgical procedure enhances the experience.

In the present study, the mean duration of hospital stay was 6.87 days. Attaallah et al.<sup>7</sup> found the mean duration of hospital stay as 5 days for 33 patients. The higher mean duration of hospital stay in the present study was attributed to the presence of three patients with major complications. Nevertheless, based on the studies in the literature that compared the open surgery with laparoscopic surgery, duration of hospital stay is shorter in laparoscopic surgery.

## Conclusion

Although currently the laparoscopic colorectal surgery is not the gold standard, it gives satisfactory outcomes as compared to open surgery in many aspects such as oncological principals, cosmetic outcomes, early recovery, and patient satisfaction. Considering the short-term outcomes of the present study, the results are consistent with the literature.

## Ethics

Ethics Committee Approval: Retrospective study, Informed Consent: Consent form was filled out by all participants.

Peer-review: Internally peer-reviewed.

## Authorship Contributions

Surgical and Medical Practices: Eyüp Murat Yılmaz, Concept: Eyüp Murat Yılmaz, Erdem Barış Cartı, Altay Kandemir, Design: Eyüp Murat Yılmaz, Erdem Barış Cartı, Altay Kandemir, Data Collection or Processing: Eyüp Murat Yılmaz, Erdem Barış Cartı, Altay Kandemir, Analysis or Interpretation: Eyüp Murat Yılmaz, Literature Search: Eyüp Murat Yılmaz, Writing: Eyüp Murat Yılmaz.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

## References

1. Miskovic D, Ni M, Wyles SM, Tekkis P, Hanna GB. Learning curve and case selection in laparoscopic colorectal surgery: systematic review and international multicenter analysis of 4852 cases. *Dis Colon Rectum* 2012;55:1300-1310.
2. Shanker BA, Soliman M, Williamson P, Ferrara A. Laparoscopic Colorectal Training Gap in Colorectal and Surgical Residents. *JLS* 2016;20.
3. Kalfaoğlu M, Hansel H, Cevheroğlu C, Gürkut Ö, Ciner F, Beroval Ö, ve ark. KKTC'de Laparoskopik Kolorektal Cerrahi Deneyimimiz. *Kolon Rektum Hast Derg* 2013;23:157-161.
4. Wilder FG, Burnett A, Oliver J, Demyen MF, Chokshi RJ. A Review of the Long-Term Oncologic Outcomes of Robotic Surgery Versus Laparoscopic Surgery for Colorectal Cancer. *Indian J Surg* 2016;78:214-219.

5. Melkonian E, Heine C, Contreras D, Rodriguez M, Opazo P, Silva A, et al. Reversal of the Hartmann's procedure: A comparative study of laparoscopic versus open surgery. *J Minim Access Surg* 2016;27.
6. Ivatury SJ, Bostock Rosenzweig IC, Holubar SD. Short-term Outcomes After Open and Laparoscopic Colostomy Creation. *Dis Colon Rectum* 2016;59:543-550.
7. Attaallah W, Babayev H, Yardımcı S, Cingi A, Uğurlu MÜ, Günel Ö. Laparoscopic resection for colorectal diseases: short-term outcomes of a single center. *Ulus Cerrahi Derg* 2016;32:199-202.
8. Kurt A, Tekinel M, Aksoy S, Yanar H. Laparoscopic resection for the colorectal diseases: first 26 cases. *CÜ Tıp Fakültesi Dergisi* 2008;30:14-19.
9. Martel G, Boushey RP. Laparoscopic colon surgery: past, present and future. *Surg Clin North Am* 2006;86:867-897.
10. Buğra D. Laparoskopik Kolon Cerrahisi. *Kolon ve Rektum Kanserleri*. İstanbul: 2010; 253-290.
11. Gupta A, Watson DI. Effect of laparoscopy on immune function. *Br J Surg* 2001;88:1296-1306.
12. Curet MJ, Putrakul K, Pitcher DE, Jossloff RK, Zucker KA. Laparoscopically assisted colon resection for colon carcinoma: perioperative results and long term outcome. *Surg Endosc* 200;14:1062-1066.
13. Clinical Outcomes of Surgical Therapy Study G. A comparison of laparoscopically assisted and open colectomy for colon cancer. *N Engl J Med* 2004;350:2050-2059.
14. Stocchi L, Nelson H. Laparoscopic colectomy for colon cancer: trial update. *J Surg Oncol* 1998;68:255-267.
15. Gilmore BF, Sun Z, Adam M, Kim J, Ezekian B, Ong C, Migaly J, Mantyh CR. Hand-Assisted Laparoscopic Versus Standard Laparoscopic Colectomy: Are Outcomes and Operative Time Different? *J Gastrointest Surg* 2016.