RESEARCH / ARAŞTIRMA
DOI: 10.26650/IUITFD.1280696
İst Tıp Fak Derg 2023 / J Ist Faculty Med 2023

COMPARISON OF POSTOPERATIVE AND ONCOLOGICAL OUTCOMES IN ROBOTIC AND OPEN RIGHT COLECTOMY FOR COLON CANCER

KOLON KANSERİNDE ROBOTİK VE AÇIK SAĞ KOLEKTOMİNİN POSTOPERATİF VE ONKOLOJİK SONUÇLARININ KARŞILAŞTIRILMASI

Sercan YÜKSEL[1], Uğur TOPAL[1], Ece BATUR[1], Anıl DEMİR[1], İsmail ÇALIKOĞLU[1], Erdal KARAKÖSE[1], Erdal ERCAN[1], Zafer TEKE[1], Hasan BEKTAŞ[1]

[1]Basaksehir Cam and Sakura City Hospital, General Surgery Clinic, Istanbul, Turkiye

ORCID IDs of the authors: S.Y. 0000-0002-9069-7774; U.T. 0000-0003-1305-2056; E.B. 0000-0002-8931-6241; A.D. 0000-0001-9999-2959; İ.Ç. 0000-0002-9995-0940; E.K. 0000-0003-1491-0526; E.E. 0000-0001-5558-3977; Z.T. 0000-0001-8869-6476; H.B. 0000-0002-6307-6075

Cite this article as: Yuksel S, Topal U, Batur E, Demir A, Calikoglu I, Karakose E, et al. Comparison of postoperative and oncological outcomes in robotic and open right colectomy for colon cancer. J Ist Faculty Med 2023;86(3):185-191. doi: 10.26650/IUITFD.1280696

ABSTRACT

Objective: This study aims to compare the short-term outcomes of robotic right hemicolectomy for right-sided colon cancer to those of conventional open right hemicolectomy.

Material and Method: Patients who underwent surgical treatment for right-sided colorectal cancer between 2020 and 2022 were included in the study. Patients had been divided into two groups: Group 1, who underwent conventional surgery, and Group 2, who underwent robotic surgery. Clinical data and preoperative findings of patients were compared between the groups.

Result: A total of 51 patients participated in our study. Group 1 consisted of 39 patients and Group 2 consisted of 12 patients. The mean age was 60.7 vs. 62.3 (p=0.773). No conversions or intraoperative complications occurred. Extended right hemicolectomy was performed in 23.1% vs. 8.36% (p=0.083). The operation time was longer in Group 2 (2.84 vs. 3.04, p=0.023). One patient in Group 1 underwent reoperation for ileus during the postoperative period. T3-stage tumors (48.7% vs. 50%, p=0.794) and N0 lymph node metastasis (38.5% vs. 41.7%, p=0.827) were detected most frequently. The total number of lymph nodes dissected was 37.2 vs. 41.9 (p=0.179). The number of malignant lymph nodes was 2.54 vs. 6.42 (p=0.881). The most common Clavien-Dindo score was 1 in both groups (79.5% vs. 83.3%, p=0.339). The length of stay was similar between the groups (6.38 vs. 5.92, p=0.156). Readmission occurred in 6 patients in Group 1, with reasons being anastomotic leakage, ileus, and general condition disorder.

ÖZET

Amaç: Bu çalışma, sağ kolon kanseri için robotik sağ hemikolektominin kısa vadeli sonuçlarını konvansiyonel sağ hemikolektomiyle karşılaştırmayı amaçlamaktadır.

Gereç ve Yöntem: 2020-2022 yılları arasında sağ taraf yerleşimli kolorektal kanser nedeniyle cerrahi tedavi uygulanan hastalar çalışmaya dahil edildi. Hastalar konvansiyonel cerrahi geçirenler Grup 1, robotik cerrahi uygulananlar Grup 2 olmak üzere 2 gruba ayrıldı. Bu gruplarda hastalara ait klinik veriler ve peroperatif sonuçlar karşılaştırıldı.

Bulgular: Çalışmamıza 51 hasta katıldı. Grup 1 39 hastadan, Grup 2 12 hastadan oluşuyordu. Yaş ortalaması (60,7 ve 62,3 p=0,773) idi. Hiçbir dönüşüm veya intraoperatif komplikasyon oluşmadı. Genişletilmiş sağ hemikolektomi (%23,1 ve %8,36 p=0,083) oranında uygulandı. Operasyon süresi Grup 2'de uzundu (2,84 ve 3,04 p=0,023). Grup 1'de bir hasta postoperatif dönemde ileus nedeniyle tekrar ameliyat edildi. En sık T3 evre tümörler (%48,7 ve %50, p=0,794) ve N0 (%38,5 ve %41,7, p=0,827) saptanmıştı. Lenf nodu diseksiyonu sayıları total lenf nodları 37,2 ve 41,9 (p=0,179) ve malign nodlar 2,54 ve 6,42 (p=0,881) idi. En sık görülen Clavien-Dindo skoru her iki grupta da 1 idi (%79,5 ve %83,3, p=0,339). Yatış süresi gruplarda benzerdi (6,38 ve 5,92, p=0,156). Grup 1'de 6 hastada hastaneye tekrar başvuru görüldü. Başvuru sebepleri anastomoz kaçağı, ileus ve genel durum bozukluğu idi.

Corresponding author/İletişim kurulacak yazar: Sercan YÜKSEL – drsercanyuksel@gmail.com

Submitted/Başvuru: 13.04.2023 • **Revision Requested/Revizyon Talebi:** 25.04.2023 •
Last Revision Received/Son Revizyon: 14.06.2023 • **Accepted/Kabul:** 24.06.2023 • **Published Online/Online Yayın:** 25.07.2023

Conclusion: Our experience shows the feasibility and safety of robotic surgery for the treatment of right-sided colon cancer. This method has provided satisfactory short-term outcomes.

Keywords: Colorectal cancer, robotic surgery, right colectomy, postoperative complications, oncologic outcomes

Sonuç: Deneyimlerimiz sağ kolon kanserinin tedavisi için robotik cerrahinin fizibilitesini ve güvenliğini doğrulamaktadır. Bu yöntem tatmin edici kısa vadeli sonuçlar sağlamıştır.

Anahtar Kelimeler: Kolorektal kanser, robotik cerrahi, sağ kolektomi, postoperatif komplikasyon, onkolojik sonuçlar

INTRODUCTION

Over the past few decades, medicine and surgery have made unprecedented strides in technology. Historically, these advances were driven purely by science; however, today, industry interests have become powerful drivers of development. Rapid advancements in minimally invasive surgical technology are both challenging and fascinating, making it difficult to distinguish between passing trends and scientific evidence (1).

Colorectal cancer is the third most common malignancy and the second leading cause of cancer deaths worldwide. In 2020, there were 1.9 million cases, with an estimated 0.9 million deaths globally (2). Surgery remains the cornerstone of treatment. Right colectomy is a procedure frequently performed by general and colorectal surgeons to treat malignancies of the cecum, right colon, and hepatic flexure. In contemporary times, the most appropriate surgical approach for these resections is often debated (3).

Minimal invasive (MI) surgery is gaining acceptance as the treatment choice of colorectal cancer worldwide. Numerous non-oncological quality-of-life advantages have been reported over the conventional open approach, with less postoperative pain, shorter inpatient duration, faster return to daily activities, and better cosmetic outcomes. Long-term oncological outcomes have been found to be at least equivalent to the traditional surgical approach (4-6).

Robotic surgical platforms, such as the da Vinci surgical system, have been designed to address many of the limitations of laparoscopic surgery. Some of the advantages provided include a stable three-dimensional view directly controlled by the operating surgeon, elimination of tremors, improved ergonomics, and 180° articulation with a 540° rotation for a wider range of motion. However, there has been widespread criticism of robotic right hemicolectomy (RRH), including increased cost and longer operation time, as well as the inartificial advantages of robotic platforms being less remarkable in the larger intra-abdominal cavity compared to the pelvis, and impaired ergonomics and range of motion due to instrument collision (7,8).

A review of the literature reveals that robotic surgery is more frequently applied in rectal cancer due to these reasons, and comparative studies on the use of robots in colorectal cancer often involve rectal cancer cases. There are limited trials in the literature on the occupation of robots in right colon cancer (3-6).

In our study, we aimed to present the experience of a newly established robotic surgery center in a tertiary hospital by comparing right hemicolectomy experiences with the conventional method, considering the existing literature.

MATERIAL and METHODS

After obtaining approval from Basaksehir Cam and Sakura City Hospital Local Ethics Committee (Date: 26.01.2022, No: 30), patients who underwent surgical resection for colorectal cancer between 2020 and 2022 were included in our study. Patients under 18 years of age, those who underwent laparoscopic surgery, those with benign pathology results, and those with non-adenocarcinoma malignancies were excluded from the study. A retrospective analysis was conducted using a prospective database created from nurse observation forms, anesthesia records, and pathology reports in the Electronic Health Record system.

Patients were separated into two groups based on the surgical technique used: Group 1 underwent conventional surgery, and g+roup 2 underwent robotic surgery. We compared demographic data, American Society of Anesthesiologists (ASA) scores, preoperative tumor marker levels, hemoglobin and albumin levels, neoadjuvant treatment status, and tumor location for these groups. Additionally, intraoperative complications, conversion, operation time, and histopathological parameters such as tumor diameter, total number of dissected and metastatic lymph nodes, distance to the surgical margin, and TNM stage were assessed. Postoperative quality indicators, including hospital stay duration, 90-day reoperation, 90-day readmission, 30-day postoperative mortality, Clavien-Dindo complication severity, and adjuvant treatment status, were also recorded.

Surgical indications were determined for all patients at the institutional multidisciplinary meeting discussion.

Preoperative colonoscopy image evaluation and thorax-abdominal-pelvic computed tomography (CT) scans were routinely performed for all patients, with Positron Emission Tomography and CT (PET-CT) scans performed when deemed necessary. Fast-track protocols were attempted for each patient. The pathological stage of the disease was determined according to the TNM Classification (8,9). Unplanned reoperations were considered as surgical procedures under general, spinal, or epidural anesthesia within 90 days of the index operative procedure for any reason, excluding follow-up procedures based on pathology results, in accordance with the The American College of Surgeons (ACS) National Surgical Quality Improvement Program (NSQIP) definition (10). Conversion to open surgery was defined as completing any part of the procedure with the open technique, except for the removal of the surgical specimen. The operative time was defined as the duration from the first skin incision to the final closure of the abdominal wall. The Clavien-Dindo classification was used to define and grade postoperative complications (11).

Surgical procedures

The preference for the robotic technique was based merely on the availability of the robotic system and the surgeon's preference. All robotic operations were performed by a single surgeon. On the day before the operation, all patients underwent mechanical bowel preparation and received antibiotic prophylaxis with ceftriaxone (2 g IV) and metronidazole (500 mg IV) just prior to the surgery. In both groups, a Foley catheter and a nasogastric tube were routinely placed in the operating room following the induction of general anesthesia.

The same surgeon performed all robotic operations using the Da Vinci Xi Surgical System (Intuitive Surgical Inc., Sunnyvale, CA, USA).

Pneumoperitoneum was created by puncturing the patients' umbilicus with a Veress needle, achieving an intra-abdominal pressure of 10 mmHg. An 8 mm robotic port was placed in the midline suprapubic area, and all intra-abdominal quadrants were examined with a 30-degree optic to exclude peritoneal metastases. The other three robotic ports were placed under direct vision, aligned to form a straight line between the suprapubic robotic port and the left arcus costa, and spaced 6-10 cm apart. A 10 mm laparoscopic port, to be used by the assistant surgeon for clipping, linear endostapler, aspiration, gauze, and suture insertions and removals, was placed in the left lower quadrant, forming a triangle with the two robotic ports on the left side of the abdominal wall. After placing the ports, patients were positioned in a 15-degree reverse Trendelenburg position. The Da Vinci Surgical System was brought to the operating table from the patients' right side.

Robotic colon resections were performed in defined standard steps. Right hemicolectomy or extended right hemicolectomy was chosen based on tumor location. All patients underwent complete mesocolic excision (CME). During the medial dissection step of the ascending colon, the ileocolic artery and vein, superior mesenteric vein (SMV), and superior mesenteric artery (SMA) were dissected with Monopolar Curved Scissors (Intuitive da Vinci Robotic Surgical Systems) and clipped with Hem-o-lok. The dissection of the mesocolon continued in a caudo-cranial direction, and the right colic artery and vein were clipped with Hem-o-lok and cut. Right branches of the middle colic artery and vein in patients with ascending colon tumors were clipped with Hem-o-lok during the cranio-caudal mesocolic dissection, and right branches of the middle colic artery and vein in patients with hepatic flexure or transverse colon tumors were clipped with Hem-o-lok, freeing the colonic mesentery. The posterior mesocolon was dissected from medial to lateral, preserving the perirenal fascia. During lateral dissection of the ascending colon, Toldt's fascia was incised from the hepatic peritoneal attachment to the pelvic peritoneal space. The gastrocolic ligament was cut from the right half of the transverse colon for hepatic flexure mobilization. The mesocolon was dissected over the pancreas and duodenum, and encountered branches of the Henle trunk were clipped and cut. In hepatic flexure and transverse colon tumors, the greater omentum was removed along with the colon segment to be respected.

The proximal resection margin for all patients was set as the terminal ileum, 5-10 cm proximal to the ileocecal valve. In patients with colon tumors, the transverse colon's proximal blood supply was deemed adequate for the distal resection margin. For patients with hepatic flexure tumors and transverse colon tumors, the distal region of the transverse colon was chosen as the site with sufficient blood supply. The distal and proximal borders of the mesocolon were cut using Monopolar Curved Scissors and Maryland Bipolar Forceps (Intuitive da Vinci Robotic Surgical Systems). Colon and ileum resections were performed with an Endo stapler using a 10 mm assistant port. The specimen was removed through a mini-incision made in the median supra-umbilical region using an Alexis Wound Protector-Retractor (Applied Medical).

During the anastomosis stage, an anvil was inserted into the anti-mesenteric wall of the distal ileum. The ileocolic anastomosis was performed extracorporeally by placing the circular stapler in the transverse colon.

For patients who underwent conventional surgery, all steps were performed openly with a median incision above and below the umbilicus.

Statistical analysis

The SPSS SPSS ver. 23.0 (IBM Corp., Armonk, NY) software was used for the statistical analysis of the data. Cat-

egorical measurements were summarized as numbers and percentages, while continuous measurements were presented as mean and standard deviation (median and minimum-maximum where appropriate). The chi-square test was employed for the analysis of categorical variables. The Shapiro-Wilk test was utilized to determine whether the parameters in the study exhibited a normal distribution. For parameters that did not demonstrate a normal distribution, the Mann-Whitney U test was used in paired group analysis. The statistical significance level for all tests was set at 0.05.

RESULTS

A total of 51 patients participated in our study, with Group 1 consisting of 39 patients and Group 2 comprising 12 patients. The male gender was predominant in both groups (74.4% vs. 58.3%, p=0.287). The mean ages were 60.7 and 62.3 (p=0.773). The most common ASA score was 2 in both groups (22% vs. 10%, p=0.317). Tumor localization in the ascending colon was more frequent in both groups (46.2% vs. 58.3%, p=0.726). Demographic and clinical data can be found in Table 1.

In Group 1, four patients had mucinous adenocarcinoma. The most common tumor grade was G2 in both groups (82.1% vs. 66.7%, p=0.553). Macroscopic tumor perforation (p=0.942), presence of lymphovascular invasion (p=0.202), presence of perineural invasion (p=0.696), and tumor budding presence (p=0.338) were similar between the groups. T3 stage tumors (48.7% vs. 50%, p=0.794) and N0 lymph node metastases (38.5% vs. 41.7%, p=0.827) were the most frequently detected pathological features. The largest mean tumor diameters were 52.5 mm and 68.7 mm (p=0.135). The total number of lymph nodes dissected was 37.2 and 41.9 (p=0.179). The number of malignant lymph nodes was 2.54 and 6.42 (p=0.881). Pathological features are displayed in Table 2.

Extended right hemicolectomy was performed in 23.1% and 8.36% of patients (p=0.083). The operation time was longer in Group 2 (2.84 vs. 3.04, p=0.023). No intraoperative complications or conversions to open surgery occurred in any patients. One patient in Group 1 underwent reoperation for ileus in the postoperative period. In both study groups, the most frequently observed Clavien-Dindo classification was grade 1 (79.5% vs. 83.3%, p=0.339). The length of hospital stay was similar between the groups (6.38 vs. 5.92, p=0.156). Readmission occurred in 6 patients from Group 1, with causes including anastomotic leakage, ileus, and general condition disorder. The

Table 1: Demographic characteristics and preoperative findings of the patients

	Open (n=39)	Robotic (n=12)	Total (n=51)	p
	n (%)	n (%)	n (%)	
Gender				
Male	29 (74.4)	7 (58.3)	36 (70.6)	0.287[a]
Female	10 (25.6)	5 (41.7)	15 (29.4)	
Age mean±SD	60.7±14.3	62.3±14.1	61.1±14.1	0.773[b]
ASA score				
1	5 (12.8)	-	5 (9.8)	0.317[a]
2	22 (56.4)	10 (83.3)	32 (62.7)	
3	10 (25.6)	2 (16.7)	12 (23.5)	
4	2 (5.1)	-	2 (3.9)	
CEA (µg/L) (mean±SD)	25.3±104.8	9.12±10.7	23.1±97.2	0.766[b]
CA 19.9 (U/ml) (mean±SD)	154.4±756.7	17.6±11.7	135.9±703.8	0.982[b]
Hemoglobin (g/dl) (mean±SD)	10.9±1.8	10.6±1.6	10.9±1.7	0.526[b]
Albumin (g/dl) (mean±SD)	39.2±5.5	40.0±3.9	39.4±5.1	0.760[b]
Tumor localization				
Caecum	12 (30.8)	3 (25)	15 (29.4)	0.726[a]
Ascending colon	18 (46.2)	7 (58.3)	25 (49)	
Hepatic flexura	6 (15.4)	2 (16.7)	8 (15.7)	
Transverse colon	3 (7.7)	-	3 (5.9)	

* p<0.05, [a]: Chi-square, [b]: Mann Whitney U, ASA: American Society of Anesthesiology, CEA: Carcinoembryonic antigen, CA: Cancer antigen

Table 2: Pathological findings of study groups

	Open (n=39)	Robotic (n=12)	Total (n=51)	p
	n (%)	n (%)	n (%)	
Type of tumor				
Adenocarcinoma	34 (87.1)	12 (100)	46 (90.2)	0.426[a]
Mix adenocarcinoma	1 (2.6)	-	1 (2)	
Mucinous adenocarcinoma	4 (10.3)	-	4 (7.8)	
Tumor grade (Differentiation)				
G1	3 (7.7)	2 (16.7)	5 (9.8)	0.553[a]
G2	32 (82.1)	8 (66.7)	40 (78.4)	
G3	3 (7.7)	2 (16.7)	5 (9.8)	
G4	1 (2.6)	-	1 (2)	
Presence of macroscopic tumor perforation	3 (7.7)	1 (8.3)	4 (7.8)	0.942[a]
Presence of lymphovascular invasion	29 (74.4)	11 (91.7)	40 (78.4)	0.202[a]
Presence of perineural invasion	17 (43.6)	6 (50)	23 (45.1)	0.696[a]
Presence of tumor budding	27 (69.2)	10 (83.3)	37 (72.5)	0.338[a]
T stage				
T2	4 (10.3)	2 (16.7)	6 (11.8)	0.794[a]
T3	19 (48.7)	6 (50)	25 (49)	
T4	16 (41)	4 (33.3)	20 (39.2)	
N stage				
N0	15 (38.5)	5 (41.7)	20 (39.2)	0.827[a]
N1a	3 (7.7)	-	3 (5.9)	
N1b	11 (28.2)	3 (25)	14 (27.5)	
N2a	6 (15.4)	3 (25)	9 (17.6)	
N2b	4 (10.3)	1 (8.3)	5 (9.8)	
Closest tumor margin (proximal or distal) mm (mean±SD)	102.4±43.7	78.8±22.9	96.8±40.9	0.074[b]
Widest tumor diameter mm (mean±SD)	52.4±25.6	68.7±32.6	56.2±27.9	0.135[b]
No. of total lymph nodes (mean±SD)	37.2±19.6	41.9±9.9	38.3±17.8	0.179[b]
No. of malign lymph nodes (mean±SD)	2.54±3	6.42±15.2	3.45±7.8	0.881[b]

* $p<0.05$, [a]: Chi-square, [b]: Mann Whitney U

rates of receiving adjuvant treatment were similar in the groups (82.1% vs. 75%, p=0.591). The perioperative and postoperative periods are presented in Table 3.

DISCUSSION

In our study comparing robotic right hemicolectomy (RRC) with conventional right hemicolectomy (CRC), we found that robotic colorectal resections using a robotic platform are as safe as performing a conventional RRC when appropriate training and experience are available. Our findings showed comparable morbidity rates to those observed with CRC, adequate lymph node dissection, and despite the longer operation time, no increased morbidity was detected.

A 2016 study from Denmark reported a conversion rate of around 20% in patients undergoing minimally invasive CME, with a 9.1% intraoperative organ injury and a 6.2% mortality rate observed in the entire series (12). Although the results of this study may cause surgeons to approach with caution, centers around the world have shown lower levels of morbidity in their studies than initially reported (13,14). In their study comparing robotic and convention-

Table 3: Perioperative and postoperative clinical outcomes

	Open (n=39)	Robot (n=12)	Total (n=51)	p
	n (%)	n (%)	n (%)	
Type of surgery				
Extended right hemicolectomy	9 (23.1)	1 (8.36)	10 (19.6)	0.083[a]
Right hemicolectomy	29 (74.4)	11 (91.7)	40 (78.4)	
Right hemicolectomy + liver metastasectomy	1 (2.6)	-	1 (2.0)	
Operation time (hours) (mean±SD)	2.84±2.9	3.04±0.9	2.89±2.6	**0.023*[,b]**
Reoperation	1 (2.6)	-	1 (2.0)	0.575[a]
Clavien Dindo Score				
1	31 (79.5)	10 (83.3)	41 (80.4)	0.339[a]
2	4 (10.3)	1 (8.3)	5 (9.8)	
3a	2 (5.1)	-	2 (3.9)	
3b	-	1 (8.3)	1 (2.0)	
5	2 (5.1)	-	2 (3.9)	
Length of stay (days) (mean±SD)	6.38±3.0	5.92±2.5	6.27±2.9	0.156[b]
Readmission 90 days	6 (15.4)	-	6 (11.6)	0.148[a]
30-days mortality	2 (5.1)	-	2 (3.9)	0.424[a]
Adjuvant treatment	32 (82.1)	9 (75.0)	41 (80.4)	0.591[a]

* p<0.05, [a]: Chi-square, [b]: Mann Whitney U

al methods for right colon cancer, Larach et al. did not report any conversions and found a similar overall complication rate in the postoperative period, indicating that this allowed for enhanced postoperative recovery (15). Hirschburger et al.'s study showed that the robotic approach was superior to conventional methods in terms of postoperative complication rates, particularly wound infections, and shorter hospital stays (16). In our series, no conversions were reported, and although the operation time was longer in the robot group, it did not affect the postoperative period. We did not identify a specific complication or reason for re-admission due to robot use.

Regarding cancer management, oncological standards defined mainly by open surgical techniques should be taken into account. In terms of the intestinal, mesorectal, and mesocolic envelopes, the resected specimen should be left intact. The resection margins should be appropriate and preferably exceed negative margins. Ideally, the margins should be greater than 5 cm. The technique should also allow for adequate lymph node uptake for staging and therapeutic purposes, with more than 12 lymph nodes for every anatomical segment (17,18). The current literature suggests that there is a higher lymph node harvesting efficiency in minimally invasive robotic surgery for CME performed in RRC cases, but there is insufficient evidence on this topic (16,19). There are also studies reporting a lower number of lymph nodes in robotic surgery despite having an adequate number (15). In our series, the number of lymph nodes harvested and the distances to the surgical margin were sufficient in both groups, which we attributed to the experience of the robotic surgery team in laparoscopy.

Financial constraints in modern medicine require considering the implementation and maintenance costs of new technology alongside patient outcomes. Cost analyses in studies are challenging due to numerous factors affecting the cost both directly and indirectly. Another study examining the largest hospital-based comparative databases in the United States, with 17,265 laparoscopic and 744 robotic procedures, found that robotic surgery was associated with a $5,272 higher total hospitalization cost and $4,432 direct cost compared to laparoscopic surgery (20). Consequently, it is justifiable to assume that robotic surgery may not be a cost-effective option under prevailing circumstances.

Several studies in the literature have reported long-term oncological outcomes of robotic right hemicolectomy in different patient populations. Spinoglio et al. reported disease-specific survival rates of 94.5%, disease-free survival rates of 91.4%, and overall survival rates of 90.3% in their series of 100 patients undergoing CME with robotic right hemicolectomy, during a median follow-up period of 48.5 months

(range, 24-114 months) (6). In the pilot studies of Huscher et al., which included 123 patients undergoing robotic right hemicolectomy, the median follow-up period was 39 months (IQR, 25-55), with a median overall survival of 69 months (95% CI, 57-80) and a mean disease-free survival of 67 months (95% CI, 65-68) (21). However, the literature currently lacks sufficient evidence to support the claim that robotic surgery provides a survival advantage for right colon cancer. In our series, we were unable to present long-term oncological outcomes due to insufficient patient follow-up periods.

The major limitation of this study was the limited quantity of patients and its retrospective nature. Additionally, as our center is newly established, we could not present long-term oncological results and cost analyses.

CONCLUSION

In our study, we compared robotic surgery and conventional surgery with similar dissection widths and comparable morbidity profiles. To confirm these results and obtain long-term oncological outcomes, prospective multicenter studies are necessary.

Ethics Committee Approval: This study was approved by Basaksehir Cam and Sakura City Hospital Local Ethics Committee (Date: 26.01.2022, No: 30)

Peer Review: Externally peer-reviewed.

Author Contributions: Conception/Design of Study- H.B., S.Y., U.T., Z.T.; Data Acquisition- E.B., E.E., E.K., İ.Ç.; Data Analysis/Interpretation- U.T., S.Y., A.D.; Drafting Manuscript- S.Y., U.T., E.K., E.B., A.D.; Critical Revision of Manuscript- H.B., Z.T., E.E., İ.Ç.; Final Approval and Accountability- H.B., Z.T., U.T.; Material or Technical Support- İ.Ç., A.D., S.Y., E.B.; Supervision- H.B., E.E., E.K.

Conflict of Interest: The authors have no conflict of interest to declare.

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

REFERENCES

1. Zelhart M, Kaiser AM. Robotic versus laparoscopic versus open colorectal surgery: towards defining criteria to the right choice. Surg Endosc 2018;32(1):24-38. [CrossRef]
2- Xi Y, Xu P. Global colorectal cancer burden in 2020 and projections to 2040. Transl Oncol 2021;14(10):101174. [CrossRef]
3. Rausa E, Kelly ME, Asti E, Aiolfi A, Bonitta G, Bonavina L. Right hemicolectomy: a network meta-analysis comparing open, laparoscopic-assisted, total laparoscopic, and robotic approach. Surg Endosc 2019;33(4):1020-32. [CrossRef]
4. Green BL, Marshall HC, Collinson F, Quirke P, Guillou P, Jayne DG, et al. Long-term follow-up of the Medical Research Council CLASICC trial of conventional versus laparoscopically assisted resection in colorectal cancer. Br J Surg 2013;100(1):75-82. [CrossRef]
5. Colon Cancer Laparoscopic or Open Resection Study Group. Survival after laparoscopic surgery versus open surgery for colon cancer: long-term outcome of a randomised clinical trial. Lancet Oncol 2009;10(1):44-52. [CrossRef]
6. Spinoglio G, Marano A, Bianchi PP, Priora F, Lenti LM, Ravazzoni F, et al. Robotic Right Colectomy with Modified Complete Mesocolic Excision: Long-Term Oncologic Outcomes. Ann Surg Oncol 2016;23(Suppl 5):684-91. [CrossRef]
7. Hannan E, Feeney G, Ullah MF, Ryan C, McNamara E, Waldron D, et al. Robotic versus laparoscopic right hemicolectomy: a case-matched study. J Robot Surg 2022;16(3):641-7. [CrossRef]
8. Tan A, Ashrafian H, Scott AJ, Mason SE, Harling L, Athanasiou T, et al. Robotic surgery: disruptive innovation or unfulfilled promise? A systematic review and meta-analysis of the first 30 years. Surg Endosc 2016;30(10):4330-52. [CrossRef]
9. Weiser MR. AJCC 8th Edition: Colorectal Cancer. Ann Surg Oncol 2018;25(6):1454-5. [CrossRef]
10. American College of Surgeons. User guide for the 2012 ACS NSQIP participant use data file (PUF). Chicago: 014 Jan. Available from: URL: https://www.facs.org/media/r23m4qap/acsnsqip2012ptpuf-userguide.
11. Dindo D, Demartines N, Clavien PA. Classification of surgical complications: a new proposal with evaluation in a cohort of 6336 patients and results of a survey. Ann Surg 2004;240(2):205-13. [CrossRef]
12. Bertelsen CA, Neuenschwander AU, Jansen JE, Kirkegaard-Klitbo A, Tenma JR, Wilhelmsen M, et al. Short-term outcomes after complete mesocolic excision compared with 'conventional' colonic cancer surgery. Br J Surg 2016;103(5):581-9. [CrossRef]
13. Gavriilidis P, Davies RJ, Biondi A, Wheeler J, Testini M, Carcano G, et al. Laparoscopic versus open complete mesocolic excision: a systematic review by updated meta-analysis. Updates Surg 2020;72(3):639-48. [CrossRef]
14. Negoi I, Hostiuc S, Negoi RI, Beuran M. Laparoscopic vs open complete mesocolic excision with central vascular ligation for colon cancer: A systematic review and meta-analysis. World J Gastrointest Oncol 2017;9(12):475-91. [CrossRef]
15. Larach JT, Flynn J, Wright T, Rajkomar AKS, McCormick JJ, Kong J, et al. Robotic complete mesocolic excision versus conventional robotic right colectomy for right-sided colon cancer: a comparative study of perioperative outcomes. Surg Endosc 2022;36(3):2113-20. [CrossRef]
16. Hirschburger M, Schneider R, Kraenzlein S, Padberg W, Hecker A, Reichert M. Right colectomy from open to robotic - a single-center experience with functional outcomes in a learning-curve setting. Langenbecks Arch Surg 2022;407(7):2915-27. [CrossRef]
17. Quirke P, West N. Quality of surgery: has the time come for colon cancer? Lancet Oncol 2015;16(2):121-2. [CrossRef]
18. West NP, Hohenberger W, Weber K, Perrakis A, Finan PJ, Quirke P. Complete mesocolic excision with central vascular ligation produces an oncologically superior specimen compared with standard surgery for carcinoma of the colon. J Clin Oncol 2010;28(2):272-8. [CrossRef]
19. Kelley SR, Duchalais E, Larson DW. Robotic right colectomy with intracorporeal anastomosis for malignancy. J Robot Surg 2018;12(3):461-6. [CrossRef]
20. Keller DS, Senagore AJ, Lawrence JK, Champagne BJ, Delaney CP. Comparative effectiveness of laparoscopic versus robot-assisted colorectal resection. Surg Endosc 2014;28(1):212-21. [CrossRef]
21. Huscher CGS, Lazzarin G, Marchegiani F, Marks J. Robotic