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Laparoscopic right hemicolectomy: comparison of medial and lateral approach

Laparoskopik sağ hemikolektomi: medial ve lateral yaklaşımın karşılaştırılması

Kamil Erözkan[1] Safa Vatansever[2] Selim Tamam[1] Mehmet Şah Benk[1]
Cem Azılı[1] Sancar Bayar[1] Ali Ekrem Ünal[1]

[1] Division of Surgical Oncology, Department of Surgery, Ankara University Cebeci Hospital, Ankara University School of Medicine, Ankara, Türkiye

[2] Surgery Department, Medical Point Hospital, Izmir University of Economics, Izmir, Türkiye

ABSTRACT

Aim: We aimed to examine the early oncological and clinical outcomes of the medial and lateral approaches for right hemicolectomy.

Materials and Methods: Laparoscopic right hemicolectomy patients who underwent medial and lateral approach techniques in our clinic between March 2010 and September 2022 were retrospectively reviewed. Demographic data of the patients, tumor, and operation characteristics, operation, clinical, pathological, mortality, and morbidity outcomes were recorded. Data were compared with the Chi-square test or Fisher Exact test according to the expected value for categorical variables. The Mann-Whitney U test was used because the data for continuous variables were not normally distributed.

Results: In total, hundred and fourteen patients who underwent laparoscopic right colon resection were included. 47 patients were operated on with the medial approach, and 67 with the lateral approach. In terms of harvested lymph node number, operation time, estimated blood loss, first fluid intake, first solid intake, first flatus, blood transfusion history, length of stay, anastomotic leaks, and mortality were not significantly different between the two approaches ($p>0.05$). However, the number of positive lymph nodes was significantly higher in the medial approach ($p=0.013$).

Conclusion: The medial and lateral approaches are feasible and effective techniques for right hemicolectomy. There is no difference between the short-term oncologic results. However, randomized controlled studies are needed for long-term results.

Keywords: Laparoscopic right hemicolectomy, medial approach, lateral approach, harvested lymph node.

ÖZ

Amaç: *Sağ hemikolektomi için medial ve lateral yaklaşımların erken onkolojik ve klinik sonuçlarını incelemeyi amaçladık.*

Gereç ve Yöntem: *Mart 2010-Eylül 2022 tarihleri arasında kliniğimizde medial ve lateral yaklaşım teknikleri ile opere edilen laparoskopik sağ hemikolektomi hastaları retrospektif yöntemle incelendi. Hastaların demografik verileri, tümör ve operasyon özellikleri, operasyon, klinik, patolojik, mortalite ve morbidite sonuçları kaydedildi. Gruplar, kategorik değişkenler için beklenen değere göre Ki-kare testi veya Fisher Exact testi ile karşılaştırıldı. Sürekli değişkenler için veriler normal dağılmadığından dolayı Mann-Whitney U testi kullanıldı.*

Bulgular: *Çalışmaya laparoskopik sağ kolon rezeksiyonu uygulanan 114 hasta dahil edildi. 47 hasta medial yaklaşımla, 67 hasta lateral yaklaşımla opere edildi. Alınan lenf nodu sayısı, operasyon süresi, tahmini kan kaybı, ilk sıvı alımı, ilk katı alımı, ilk gaz, kan transfüzyonu öyküsü, hastanede kalış süresi, anastomoz kaçağı ve mortalite açısından her iki yaklaşımda da anlamlı fark bulunmadı ($p >0,05$). Pozitif lenf nodu sayısı, medial yaklaşımda istatistiksel olarak anlamlı derecede yüksekti ($p=0,013$).*

Corresponding author: Kamil Erözkan
Division of Surgical Oncology, Department of Surgery, Ankara University Cebeci Hospital, Ankara University School of Medicine, Ankara, Türkiye
E-mail: *kamilerozkan@gmail.com*
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Sonuç: *Sağ hemikolektomi için laparoskopik cerrahi teknikler arasında medial ve lateral yaklaşımlar uygulanabilir ve etkilidir. Kısa dönem onkolojik sonuçlar arasında fark yoktur. Ancak uzun dönemli sonuçlar için randomize kontrollü çalışmalara ihtiyaç vardır.*

Anahtar Sözcükler: *Laparoskopik Sağ Hemikolektomi, Medial Yaklaşım, Lateral Yaklaşım, Çıkarılan Lenf Nodu*

INTRODUCTION

The incidence of colon cancer has been increasing worldwide. This is one of the major problems associated with cancers. In the United States, it is the third most frequent type of cancer, ranking second for women and third for men. (1). In Turkey, it ranks second for both genders and third in total (2). This type of cancer, which is very common, poses a significant problem for our country and the world. Approximately 40% of colorectal cancers are proximal colon cancers (3).

Nowadays, it is seen that many abdominal surgeries have been switched to laparoscopic approaches. One of these is colorectal cancer (CRC). The benefits include less bleeding, shorter hospital stay, and less postoperative pain (4, 5).

Efforts are being made to improve the long-term outcomes of patients undergoing surgery for colorectal cancer. The question of whether lymph nodes removed after resection are sufficient and whether the excised lymph nodes will be therapeutically beneficial is still being debated. Many studies have indicated that removing more lymph nodes improves disease-free survival and overall survival (6-8).

Multiple surgical techniques have been established for right colon malignancies during laparoscopic surgeries. The most accepted approaches are artery-first, medial-to-lateral (MtL), lateral-to-medial (LtM), and superior-to-inferior or inferior-to-superior approaches. The most commonly used methods are the MtL and LtM approaches (9, 10). In our study, we aimed to examine the early oncological and clinical outcomes of these two approaches, especially the number of harvested lymph nodes.

MATERIALS AND METHODS

First, this was a retrospective study. This study was approved by the ethics committee. This study was conducted at the Department of Surgical Oncology. Patients who underwent laparoscopic right hemicolectomy between March 2010 and September 2022 were included. Patients who underwent right hemicolectomy and extended right hemicolectomy using only laparoscopic surgical techniques were included in the study.

Patients with ileum and appendix tumors, open-technique surgery, conversion to open-technique surgery, additional surgical operations during surgery, alternative surgical approach approaches, and previous abdominal surgery were excluded. The study comprised patients in stages I, II, and III disease. The study excluded emergency and palliative operations and patients with stages 0 and IV disease.

All operations were performed at a single center, and the approach methods were left to the surgeon's discretion. As a surgical procedure, medial dissection was started after the ascending colon was held and suspended with laparoscopic clamps in the medial-to-lateral approach. The ileocolic artery was dissected after dissecting the right colon from the retroperitoneum and visualizing the ureter. In the lateral-medial technique, the colon was medialized and Toldt's fascia was dissected first. After completing colon mobilization, the ileocolic artery was ligated. Both surgical methods were applied in a standardized manner.

Patient demographics like age and sex; operative details such as operation type, anastomosis technique, operation time, and estimated blood loss; clinical data, which included blood transfusion history, length of stay, first fluid intake, first solid intake, first flatus, short-term mortality and morbidity information; and pathological data were reviewed retrospectively. The primary outcome was the harvested lymph node numbers. The secondary outcomes were operative time, estimated blood loss, first fluid intake, first solid intake, and first flatus, length of stay, blood transfusion history, positive lymph node number, short-term (30 days) complications, and mortality.

Data were analyzed using IBM SPSS Statistics for Windows, Version 156 25.0 (Armonk, NY). Categorical variables are reported as frequency (%) and continuous variables as median (interquartile range [IQR]). Data were compared using the chi-square test or Fisher’s exact test, according to the expected value for categorical variables. The Mann-Whitney U test was used when the data for continuous variables were not normally distributed.

RESULTS

One hundred and fourteen patients who underwent laparoscopic right colon resection were included. The median age was 65 (57-73) years, and 63 (55.3%) patients were male (Table-1). There was no statistically significant variation in the patient age or sex distribution. 67 (58.8%) underwent surgery via the lateral approach. There were 47 medial approaches (51.2%).

Table-1. Baseline characteristics.

Variables	Total (N = 114)	Lateral Approach (n = 67)	Medial Approach (n = 47)	p-value
Age (years)*	65 (57-73)	64 (58-75)	66 (56-71)	0.649†
Gender				0.247‡
Male	63 (55.3%)	34 (50.7%)	29 (61.7%)	
Female	51 (44.7%)	33 (49.3%)	18 (38.3%)	

** reported as median (IQR)*
† Mann Whitney U test
‡ Chi-square test

Table-2. Tumor and operation characteristics.

Variables	Total (N = 114)	Lateral Approach (n = 67)	Medial Approach (n = 47)	p-value
Tumor Characteristics				
Tumor size (cm)*	4.5 (3.0-6.0)	5.0 (3.4-6.2)	4.0 (3.0-5.4)	0.110†
TNM Stage				**0.019‡**
Stage I	68 (59.6%)	46 (68.7%)	22 (46.8%)	
Stage II-III	46 (40.4%)	21 (31.3%)	25 (53.2%)	
Localization				-
Cecum	66 (57.0%)	40 (59.7%)	26 (55.3%)	
Ascending colon	24 (21.1%)	13 (19.4%)	11 (23.4%)	
Hepatic flexure	22 (19.3%)	12 (17.9%)	10 (21.3%)	
Transverse colon	2 (1.8%)	2 (3.0%)	0 (0.0%)	
Histopathology				-
Adenocarcinoma	94 (82.5%)	53 (79.1%)	41 (87.2%)	
Medullary carcinoma	1 (0.9%)	1 (1.5%)	0 (0.0%)	
Mucinous adenocarcinoma	18 (15.8%)	13 (19.4%)	5 (10.6%)	
Neuroendocrine carcinoma	1 (0.9%)	0 (0.0%)	1 (2.1%)	
Operation Characteristics				
Operation				0.521§
Right hemicolectomy	103 (90.4%)	59 (88.1%)	44 (93.6%)	
Extended right hemicolectomy	11 (9.6%)	8 (11.9%)	3 (6.4%)	
Anastomosis				**0.015§**
Intracorporeal	10 (8.8%)	2 (3.0%)	8 (17.0%)	
Extracorporeal	104 (91.2%)	65 (97.0%)	39 (83.0%)	

** reported as median (IQR)*
† Mann Whitney U test
‡ Chi-square test
§ Fisher's exact test

Table-3. Outcomes.

Variables	Total (N = 114)	Lateral Approach (n = 67)	Medial Approach (n = 47)	p-value
Operation Outcomes				
Operation time (min.)*	160 (135-200)	175 (135-210)	150 (130-190)	0.202†
Estimated blood loss (ml)*	100 (60-140)	100 (50-140)	100 (70-140)	0.607†
Clinical Outcomes				
First oral fluid intake (days)*	1 (1-1)	1 (1-1)	1 (1-1)	0.369†
First oral solid food intake (days)*	3 (3-3)	3 (3-3)	3 (3-3)	0.537†
Time to first flatus (days)*	2 (2-3)	2 (2-3)	2 (2-3)	0.150†
Blood transfusion (ERT unit)*	0 (0-1)	0 (0-1)	0 (0-1)	0.788†
Length of stay (days)*	6 (5-7)	6 (6-7)	6 (5-7)	0.911†
Pathologic Outcomes				
Harvested lymph node number*	20 (14-25)	19 (14-25)	20 (15-25)	0.624†
Positive lymph node number*	0 (0-2)	0 (0-1)	1 (0-3)	**0.013†**
Mortality and Morbidity Outcomes				
Complication	20 (17.5%)	8 (11.9%)	12 (25.5%)	0.060‡
Anastomotic leakage	4 (3.5%)	3 (4.5%)	1 (2.1%)	0.642§
Other complications	16 (14.0%)	5 (7.5%)	11 (23.4%)	**0.016‡**
Mortality	3 (2.6%)	3 (4.5%)	0 (0.0%)	0.267§

** reported as median (IQR)*
† Mann Whitney U test
‡ Chi-square test
§ Fisher's exact test

The median tumor size was 4.5 (3.0-6.0) cm. 66 (57.9%) of the tumors were localized in the cecum. Histopathological examination confirmed adenocarcinoma in 94 (82.5%) patients. There were no significant differences between the groups in terms of tumor characteristics including localization and histopathology. The tumor stage was higher in the medial approach group (stage II-III rate was 53.2% vs. 31.3%, p = 0.019) (Table-2). Right hemicolectomy was performed in 103 (90.4%) patients. Anastomoses were performed extracorporeal in 104 (91.2%) patients (Table-2). There were no differences in the number of harvested lymph nodes, operation time, blood loss, first fluid intake, first solid intake, and first flatus, and blood transfusion history, length of stay, anastomotic leaks, and mortality. The outcomes of the two approaches are summarized in (Table-3). The number of positive lymph nodes was higher in the medial approach (p=0.013).

Apart from anastomotic leakage, there were some "other complications". Postoperative ileus developed in five patients, surgical site infection in four, cardiac complications in three, deep venous thrombosis in one, bleeding in one, acute renal failure in one, and perioperative duodenal injury in one. "Other complications" were higher in the medial surgery group (23.4% vs. 7.5%, p = 0.016).

DISCUSSION

The main finding of the current study is that both methods can be used for laparoscopic right hemicolectomy. This study compared two different surgical techniques for laparoscopic right hemicolectomy. These techniques are the MtL and the LtM approaches. The distribution of patients according to age and sex was similar between the groups. No statistical difference was observed when the tumor diameters and histopathological results were compared between the groups. The number of harvested lymph nodes, duration of the operation, estimated blood loss, first fluid intake, first solid intake, first flatus, blood transfusion history, length of stay, anastomotic leaks, and mortality rates were similar for both approaches.

The first technical description of laparoscopic colectomy attempted to replicate the same steps as in traditional surgery. Following the initial experience with the lateral approach, also known as the traditional approach, the technique has been standardized in various publications (11-13). In contrast, the operations were performed using the MtL approach. Some experience has been gained after initial laparoscopic operations, and new articles have stood out in the literature. These articles stated that the medial approach yielded better results (14). Furthermore, the European Association of Endoscopic Surgery consensus declared that dissection from medial to lateral is preferable (15). Despite this consensus, research on the surgical approach techniques continued. Honaker et al. argued that the medial approach is superior in their study (16). They showed that more lymph nodes could be harvested using the medial approach. The probable reason for this is a more proximal ligation of the ileocolic artery using a medial approach. Although the number of lymph nodes taken in the medial approach was higher in our study, this difference could not be statistically confirmed. In another study, it was reported that the number of dissected lymph nodes was statistically similar in both approaches (17). That study states that the advantages of the medial approach are controversial. Positive lymph node numbers and harvested lymph node numbers are important for colorectal cancer surgery. In this way, patients are directed to adjuvant treatments. Many guidelines recommend dissection of 12 or more lymph nodes for colorectal cancer surgery (18). Studies show that the survival rate increases as the harvested lymph node number (7, 19, 20). Rosenberg et al. showed that the 5-year survival rate increases as the removed number of lymph nodes. According to Peeples et al., removal of 24 lymph nodes in stage II patients and 36 lymph nodes in stage III patients improved survival. In our analysis, the number of positive lymph nodes was significantly greater in the medial approach. We believe that this is because advanced-stage patients were more common in the medial approach group.

Both techniques had a statistically equal duration of operation and blood loss amount in our research. Although the median duration of surgery was shorter with the medial approach, no statistically significant difference was observed. The medial approach has been reported to be more advantageous in terms of estimated blood loss and operation duration (21). However, in that research, patients who underwent open surgeries were compared, not laparoscopic surgeries. Another research evaluating laparoscopic colon cancer found less blood loss, less conversion, and complication rates in the medial approach (22). However, all colorectal cancer cases were evaluated in that study. Patient with right colon cancer was 27 of 50 patients. In randomized controlled research analyzing the medial approach, it was emphasized that the procedure was feasible and that the short-term oncological results, convalescence process, and estimated blood loss were acceptable (23). When the clinical outcomes were evaluated, the fluid and solid intake times were similar for both approaches. The median days for fluid and solid intake were day one and day three. The first flatus time was determined on the second day for both approaches. Xu et al. did not detect a difference between the transition to liquid food and the time to the first gas outlet between open surgical approach techniques (21). However, that study did not evaluate the transition to solid food or blood transfusion history. During hospitalization, 43 patients had a history of blood transfusions. However, 49% of patients received blood transfusions. There are two possible reasons for this finding. First, anemia frequently develops due to occult bleeding from the tumor in right colon cancer. Because these patients were already anemic, they may have required blood transfusions in the postoperative period. In addition, although the amount of perioperative bleeding was acceptable, minimal blood loss from the operation area may have led to the need for transfusion in the postoperative period. However, major bleeding occurred in only one patient, and an operation was required. Elective surgery was performed using a lateral approach. The median length of stay for both surgical approaches was 6 days. In this regard, our results are consistent with those in the literature (14, 16, 17). No research has indicated the advantage of one approach over the other in terms of length of stay.

Our study examined the short-term mortality and morbidity rates. In both surgical approaches, no differences were identified, which is consistent with the literature (16, 17, 21). Complications were divided into two in the subgroup analysis: anastomotic leakage and other complications. In the “other complications” group, there were five postoperative ileus, four surgical site infections,

three cardiac complications, one deep venous thrombosis, one bleeding, one acute renal failure, and one perioperative duodenal injury. In the subgroup analysis, “other complications" were observed more frequently with the medial approach. This was statistically significant, but the reason could not be fully explained.

This study is enlightening in terms of laparoscopic approach methods for right colon cancers. Both techniques have been shown to be both feasible and effective. It is one of only a few studies in the field that has compared laparoscopic right hemicolectomy with medial and lateral approaches. We also evaluated some clinical outcomes that were different from those reported in the literature. In other studies, the evaluation of parameters such as fluid intake, solid intake, and first flatus time was very limited. To the best of our knowledge, this is the first study to examine blood transfusions for medial and lateral approach procedures. These are the positive aspects of the present study.

However, our study has several limitations. Single-center and retrospective studies have low reliability. Multicentric randomized controlled studies are preferred for better results. Because this was a retrospective study, a selection bias may have occurred. Another limitation was that the surgical approaches preferred in recent years were not included. We know that the more lymph nodes that are harvested, the more successful the oncologic outcomes will be. However, some new techniques, such as total mesocolic excision, D3 lymphadenectomy, artery first approach, superior mesenteric vein approach, and uncinate process approach, have not been evaluated. Because, the quantities of these surgical techniques are low in our clinic, and they are not frequently preferred. We believe that these operative approaches can also affect the number of harvested lymph node numbers. In addition, the study can be confusing because it is an operation of a group of surgeons, not a single surgeon. Finally, only short-term results were considered. Therefore, long-term oncological outcomes must be evaluated. We aim to evaluate these long-term results in the future.

CONCLUSION

Medial and lateral approaches are feasible and effective laparoscopic surgical techniques for right hemicolectomy. There is no difference between the short-term oncologic results.

Conflict of interest: All authors state no competing financial.

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