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Early term results of the left colic artery preservation in colorectal cancer surgery

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ABSTRACT

Introduction: Colorectal cancer is a common type of cancer that causes significant morbidity and mortality. Post-resection anastomosis safety is important. The most important factor affecting anastomosis safety is blood accumulation in the anastomosis. In this study, we aimed to examine the early-term results of the preservation of the left colic artery (LCA) during laparoscopic anterior and low anterior resection (LAR) for the treatment of rectum and sigmoid colon cancers based on our clinical experience.

Materials and Methods: A total of 192 archive files that were operated for rectum and sigmoid colon cancer in our center between April 2019 and October 2022 were reviewed retrospectively. The patients were diagnosed using colonoscopy and biopsy during the pre-operative period. The patients and their results were discussed in the oncology council, and the patients' treatment plans were formed based on the council's decision.

Results: The patients' mean age was 65.4±9.33 years and nearly half of them were males (n=8, 53.3%). Of the patients, 12 (80%) of them underwent LAR, while three patients (20%) underwent AR. The mean duration of surgery was 322.66±101.8 min, while the median bleeding amount was 50 (20–150) cc. One patient (6.7%) required reoperation due to an anastomotic leak, and abscess drainage was performed using the transanal method. No mortality was observed in patients at 30 days.

Conclusion: In our study, the low ligation (LL) and LCA were preserved during laparoscopic AR and LARs for rectum and sigmoid colon cancers, preserving blood accumulation in the anastomosis. However, multi-center prospective randomized controlled studies are required to demonstrate whether LL significantly reduces anastomotic leaks.

Keywords: Colorectal cancer, Laparoscopy, Left colic artery

Introduction

Colorectal cancer is a common form of cancer that has a high morbidity and death rate. The primary treatment of colorectal cancer is still surgery. Laparoscopic resections can be safely performed. Low anterior resection (LAR), performed for rectum, rectosigmoid region, and sigmoid colon cancers include high ligation (HL) or low ligation

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(LL) of the anterior resection (AR) inferior mesenteric arteria (IMA). According to the American Society of Colon and Rectal Surgeons guidelines, HL is the ligation of the IMA root and does not preserve the left colic artery (LCA). LL is the ligation of IMA through the LCA branch, and it preserves LCA.[1]

Post-resection anastomosis safety is important. The most important factor affecting anastomosis safety is blood accumulation in the anastomosis. Preserving LCA can improve blood circulation, reducing anastomotic leak rates.[2] Discussions about LCA management in colorectal cancer resection are currently ongoing. In this study, we aimed to examine the early-term results of the LCA preservation in laparoscopic anterior and LAR of the rectum and sigmoid colon cancers treatment based on our clinical experience.

Materials and Methods

A total of 192 archive files that were operated for rectum and sigmoid colon cancer in our center between April 2019 and October 2022 were reviewed retrospectively. The inclusion criteria are as follows: (1) laparoscopic resection for rectum and sigmoid colon cancer; (2) postoperative pathological diagnosis of adenocarcinoma; (3) signing the notification form for the surgery; and (4) preservation of LCA and the exclusion criteria are as follows; (1) emergency surgery; (2); (3) incomplete case data; and (4) miles procedures. As a result, 15 patient files were reviewed. Demographic, perioperative, and pathological data of these patients were reviewed and analyzed.

The patients were diagnosed using colonoscopy and biopsy during the pre-operative period. Carcinoembryonic antigen levels were evaluated. Thoracoabdominal computed tomography and pelvic magnetic resonance imaging were routinely performed for staging. Positron emission tomography was selectively performed. The patients and their results were discussed in the oncology council, and the patients' treatment plans were formed based on the council's decision. Pre-surgery colon cleansing was not performed.

Surgical Technique

The patients were operated on in Lloyds Davies position, with the laparoscopic method. The abdomen formation and the tumor location, in general, determine trocar placement. A 10 mm trocar placed under the umbilicus is usually used to insert the laparoscope. For the operator, trocars of 10 mm and 12 mm are placed in the lower right quadrant, while a trocar of 5 mm is placed in the lower left lateral quadrant for the resident. An extra trocar of 12 mm is placed in the lower left quadrant if necessary. The patient was primarily in the Trendelenburg position, then the small intestine is pulled to expose the entire surgical area, and lymphatic node dissection is performed after sigmoid colon mobilization. The resident grasps the mesosigmoid containing the vessel pedicle ventrally and on the left.

First, using hook cautery, we expose the mesocolic peritoneal layer on the right side of the sigmoid colon, from the front of the right iliac artery until just anterior to the origin of the IMA. With peracute and blunt dissections, we mobilize the mesosigmoid from medial to lateral. Ureter and gonadals are preserved. After inferior mesenteric artery (IMA) and inferior mesenteric vein (IMV) dissection, the vascular ligation stage begins. The LCA should be exposed for at least 2 cm. For HL, the IMA is ligated with a vascular clip 2 cm from the aorta, reserving the hypogastric nerves. For LL, IMA is ligated preserving the arteria colica sinistra. The IMV is then ligated. After the sigmoid colon is mobilized, the rectum is released at 360 degrees on the Holy plane. Dissection is based on tumor localization. The sigmoid colon was transected with an endostapler. An endostapler was used to resect the rectum at least 2 cm distal to the tumor. The specimen was removed from the abdomen after a suprapubic cut or with transanal method. The anvil was inserted extracorporeally in suprapubic removals and intracorporeally in transanal removals. Through the suprapubic incision, the peritoneum and fascia were closed, and the abdomen was insufflated again. The anastomosis was performed with a circular stapler. Based on their strains, the left colon and splenic flexure were released. A routine air-water test was performed.

Statistical Analysis

The Kolmogorov–Smirnov test was used to evaluate the normality of the distribution of numerical variables. Numerical variables which were distributed normally were given as mean±standard deviation (SD). The non-normally distributed numerical variables were given as median (interquartile range: 25th percentile-75th percentile). Categorical variables were expressed as frequency (percentages).

Results

The patients' demographic and preoperative data are given in Table 1. The patients' mean age was 65.4±9.33 years and nearly half of them were male (n=8, 53.3%). The patients' mean body mass index was 26.6±4.06 kg/m^2. Approximately half of the patients (n=8, 53.3%) had at least one comorbidity, with hypertension (n=6, 40%) being the most common comorbidity followed by diabetes (n=5, 33.3%). Of the patients, 4 (26.7%) had a history of surgery. Of the patients, two-thirds (n=10, 66.7%) were classified as ASA 2. Twelve patients (80%) had rectum tumors, while 3 (n=20%) had sigmoid colon tumors. Nearly half of the patients (n=8, 53.3%) received neoadjuvant therapy.

The patients' operative data are given in Table 2. Of the patients, 12 (80%) of them underwent LAR, while three patients (20%) underwent AR. The mean duration of surgery was 322.66±101.8 min, while the median bleeding amount was 50 (20–150) cc. The anastomosis was performed with a size 31 circular stapler in 13 patients (86.7%) and with a size 34 circular stapler and manually in one patient (6.7%). The specimen was removed from the suprapubic incision in ten patients (66.7%), transanally in 4 (26.7%) patients, and from the sacrococcygeal incision in one patient (6.7%). In six patients (40%), a protective ileostomy was performed.

Postoperative data are given in Table 3. One patient (6.7%) required reoperation due to an anastomotic leak, and abscess drainage was performed using the transanal method. No mortality was observed in patients at 30 days. The median duration of hospitalization was 7 (5–12) days, and the mean average of lymphatic nodes removed was 17.26±7.59.

Discussion

We aimed to evaluate the early-term results of the arteria colica sinistra preservation in the rectum and sigmoid colon surgeries. It is widely accepted that blood accumulation in an anastomosis is critical for preventing an anastomotic leak. When HL is performed, blood accumulation is occurred through marginal arteries.[3,4] A comparison of tissue oxygenation near the colon resection margin revealed that the marginal artery provides sufficient vessel feeding to the transverse and descending colon. Therefore, it explained the reduced anastomotic leakage ratios reported following the increased IMA ligation.[5] In another study on the same subject, the stump stress of the marginal artery after the colon reconstruction in RC surgery with the preservation of LCA was measured. They found that the blood accumulation in the anastomosis was correlated with the stump pressure. They concluded

Table 1. Preoperative findings and demographic data of patients

Patient number	Age	Gender	BMI (kg/m^2)	Comorbidity	Previous surgery	ASA	Tumor localization
1	79	M	27.3	HT	LC	2	Rectum
2	57	M	28	CAD		2	Rectum
3	59	F	34		TAH-BSO	2	Rectum
4	67	F	27			2	Rectum
5	79	F	27.1			2	Sigmoid
6	50	M	18.9			2	Rectum+liver
7	61	M	29.4	DM, HT, CAD		3	Rectum
8	66	M	27.4	DM, HT	Coroner bypass	3	Rectum
9	52	F	28		LC	2	Rectum
10	65	M	17.9	DM, HCV		2	Sigmoid
11	64	M	25.6	DM, HT, CAD		3	Sigmoid
12	80	F	24	DM, HT		3	Rectum
13	73	F	27	HT		3	Rectum
14	68	M	31			2	Rectum
15	61	F	26			2	Rectum

M: Male; F: Female; BMI: Body mass index; HT: Hypertension; DM: Diabetes mellitus; CAD: Coronary artery disease; LC: Laparoscopic cholecystectomy; ASA: The American Society of Anesthesiologists classification.

Table 2. Intraoperative findings

Patent number	Operation	Operative time (min)	Intraoperative blood loss (ml)	Specimen extraction	Ileostomy	Stapler number	Pre-op RT
1	LAR	420	100	Transanal	No	31	No
2	LAR	540	400	Suprapubic	Yes	31	Yes
3	LAR	420	130	Transanal	No	31	Yes
4	LAR	240	50	Transanal	No	31	Yes
5	AR	270	50	Suprapubic	No	31	No
6	LAR and metastasectomy	420	400	Suprapubic	Yes	31	Yes
7	LAR	420	150	Sacrococcygeal	Yes	With a hand	Yes
8	LAR	320	160	Suprapubic	Yes	34	Yes
9	LAR	300	0	Suprapubic	No	31	No
10	AR	350	20	Suprapubic	No	31	No
11	AR	180	15	Transanal	No	31	No
12	LAR	270	0	Suprapubic	No	31	No
13	LAR	220	50	Suprapubic	Yes	31	Yes
14	LAR	240	40	Suprapubic	No	31	No
15	LAR	230	40	Suprapubic	Yes	31	Yes

LAR: Low anterior resection; AR: Anterior resection; RT: Radiotherapy.

Table 3. Post-operative findings

Patent number	Re-operation	Anastomosis complications	Hospital stay (day)	30 day mortality	Lymph nodes
1	No	-	11	-	9
2	No	-	5	-	28
3	No	-	13	-	16
4	No	-	7	-	10
5	No	-	7	-	15
6	No	-	5	-	19
7	Yes	Anastomosis leak	33	-	20
8	No	-	4	-	3
9	No	-	5	-	18
10	No	-	31	-	21
11	No	-	12	-	16
12	No	-	7	-	9
13	No	-	6	-	24
14	No	-	5	-	32
15	No	-	6	-	19

that curative surgery with the preservation of LCA can improve blood flow and decrease anastomosis complications.[6] In another study supporting this, Dworkin and Allen evaluated the effect of IMA binding on blood accumulation using Mesh Doppler flow measurement. They found that the blood circulation toward the sigmoid colon decreased 50% at least after 5 days postoperatively.[7] IMA certainly decreases blood accumulation in HL. However,

anastomosis is still nourished through marginal arteries. The handicap, here, is that some studies show that the Drummond marginal artery, also known as the Griffiths point, is absent in 5% of colorectal cancer patients.[8] The LCA preservation becomes more important for anastomosis safety, particularly in this group lacking a marginal artery. Although the rates of symptomatic anastomotic leakage and anastomotic stenosis were not significantly different in two groups, the HL group had a 6% higher incidence of anastomotic leak.[9] For tumors of the rectum and left colon, the pathways of lymphatic drainage and the metastatic distribution are from the principal colic arteries to the aortic and inferior mesenteric large groups. The LL should allow adequate lymph node dissection. The cause is that the IMA root is surrounded by LN metastases, with a reported incidence of 0.3% to 14.2%.[10] The IMA ligation root for a wide lymphatic node dissection and a high ligament are considered necessary in the curative intended rectum cancer resection.[11] The techniques' oncological results should be reliable as well. Adequate lymph node dissection is required for this. According to meta-analysis of randomized trials, no significant difference in removed lymphatic nodes numbers was found. There is also no correlation in the results of removed lymph nodes and 5-year survival. In the same study, no significant difference in postoperative mortality, morbidity, duration of surgery, and complication rates were found between the two groups. There is no correlation was found between the 5-year general survival and disease-free survival rates as well.[12] In our study, oncologically adequate lymph nodes were removed. Although laparoscopic lymphatic node dissection with the preservation of LCA is technically more difficult, adequate lymphatic node dissection can be performed with developing surgical experience and techniques. Significant differences may be demonstrated in future large-scale randomized controlled studies, and as a result, performing LL as a standard may be on the agenda.

In our study, the LL and LCA were preserved during laparoscopic AR and LARs for rectum and sigmoid colon cancers, preserving blood accumulation in the anastomosis. However, multi-center prospective randomized controlled studies are required to demonstrate whether LL significantly reduces anastomotic leaks.

Disclosures

Peer-review: Externally peer-reviewed.

Conflict of Interest: None declared.

Authorship Contributions: Concept – C.K., K.K.; Design – C.A.; Supervision – F.S.; Materials – C.G., Y.M.B.; Data collection and/or processing – E.C.; Analysis and/ or interpretation – K.K.; Literature search – K.K.; Writing – K.K.; Critical review – C.A.

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