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Original Article

The Comparison of the Quality of Life and Complications in Segmental Colectomy and Subtotal Colectomy as the Treatment for Malignant the Left Colon Tumors

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Abstract

Background: This study was designed to compare postoperative complications, mortality and quality of life associated with the type of surgery (subtotal colectomy *vs.* segmental colectomy) in patients with left colon tumors. Subtotal colectomy and segmental colectomy are the two most common strategies used for treating the left colon's malignant tumors. However, each patient's optimal elective surgical treatment for the left colon's malignant tumors is unclear. Choosing the optimal treatment for each patient, taking into account the individual conditions and preferences of the patients, with the least chance for occurrence of complications and the highest quality of life can help patients to ultimately return to everyday life.

Methods: In this retrospective multi-centric study, patients with left colon tumors who had not received neoadjuvant and have undergone subtotal colectomy or segmental colectomy from 2016 to 2018 were enrolled. Mortality rate, quality of life and postoperative complications such as problems with defecation were assessed as the main outcome measures.

Results: In patients with malignant tumors of left colon, both subtotal colectomy and segmental colectomy surgical methods reached the satisfactory results. In fact, there was no significant difference between the two surgical methods except that patients who had undergone subtotal colectomy showed better stool control capability.

Conclusion: There was no significant difference between the two surgical procedures regarding postoperative complications and quality of life.

Keywords: Colectomy, Colonic neoplasms, Defecation, Quality of life

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Introduction

Colorectal Cancer (CRC) is one of the main contributors to mortality and morbidity worldwide (1). It accounts for more than 9% of all cases of cancer (2,3). CRC is the second and third most common cancer in women and men all around the world, respectively (4). In terms of prevalence in Iran, however, CRC ranks the third most in men and the fourth in women (5), and 7 out of every 100,000 populations are involved (6). There are two kinds of surgical treatments for malignant tumors of the left colon, Segmental Colectomy (SC) and Subtotal Colectomy (STC). In the STC, the entire colon is removed, and only a very small portion of the sigmoid in size of 5-10 *cm* is kept intact, then ileocolic anastomosis is created. In the SC method, however, tumor with an appropriate margin of 5 *cm* and the lymph node, is removed, and then two remaining parts of the colon are anastomosed (colocolic anastomosis) (7). Each of these two methods has some pros and cons, and each has some potential postoperative complications, which affect the Quality of Life (QOL) after the operation. STC compared to SC, is less commonly associated with the presence of synchronous tumors, tumor recurrence, post-operation morbidity, and less surveillance. However, diarrhea and electrolyte abnormalities, such as hypokalemia, are less common in the SC technique, putting SC at more advantage compared to STC (8). According to studies, choosing the optimal surgical technique depends on two factors: the location of the tumor, and the settings of procedure (elective or emergency), depending on the patient's general condition (9). For splenic flexures neoplasms, there is no standard surgical technique and two surgical approaches are undertaken for treating these tumors: STC and left hemicolectomy (LHC) (9). According to the studies, more than 80% of the left colon cancers are located in the sigmoid colon and the less common location for left colon cancers is splenic flexure (10). In this regard, a recent study compared postoperative complications of these two methods but did not investigate the mortality and QOL associated with the type of surgical procedure. Only higher surgery-associated morbidity was reported in the STC group, mainly due to mild postoperative ileus, and no significant difference in other indices. The quality of life refers to the physiological changes that occur after surgery and affecting patient's life from various aspects. It should be noted that in addition to the mentioned indices affecting the outcome of the surgery, one of the most important variables that has a frequent incidence after surgery and highly influences patients' QOL, is the complications of surgery including diarrhea, obstruction, and anastomosis leakage. Herein, we designed a study to evaluate the patients' QOL according to the type of surgery, as well as the postoperative complications and mortality. The purpose of this study is to investigate the effect of surgery and its changes on the QOL and compare it with the two surgical methods. Since most surgical complications occur during the first year, especially the first 6 months thereafter, we also evaluated patients during the 6 months. It should be noted, however, that with this study we are not able to introduce a definitive and standard treatment for the malignant tumors of the left colon, which could be applied for all patients, but this study can help surgeons choose the best possible treatment depending on the patient's condition.

Materials and Methods

We designed a multi-centric retrospective study with prospective data collection on the databases of four colorectal surgery units, from two hospitals of Tehran University of Medical Sciences, Public Sector between 2016 to 2018. The complications of each surgery method were fully explained to the patients and written informed consents were taken from all the study participants. Detailed medical history was taken from all patients and data were extracted from the medical records. In case of missing data, the required information was recorded via a telephone call. The eligibility criteria for the patients entering to this study included: 1) confirmed diagnosis of adenocarcinomas in the distal transverse colon, splenic flexure, descending colon and proximal sigmoid colon, 2) the patient had not received neoadjuvant treatment before the surgery, 3) either of the SC or STC surgery methods was done on patients, and 4) the required patient data was complete. The exclusion criteria included patients with a history of Inflammatory Bowel Disease, colitis, previous gastrointestinal surgery and rectum, rectal and anal canal disease, previous chemotherapy, previous pelvic radiation,

neoadjuvant therapy, loop ileostomy or colostomy and diabetes mellitus. In total 536 patients with malignant left colon tumors were interviewed from 2016 to 2018. 440 patients were removed due to the exclusion criteria. In total, 96 patients with malignant tumors of the left colon who had not undergone either neoadjuvant therapy or loop ileostomy were included in this study. The patients included 25 patients in the STC group (26.04%) and 71 in the SC group (73.95%) and had undergone either surgery between 20 March 2016 and 11 July 2018.

All data on demographics and clinical features were obtained retrospectively. Malignant tumors of the left colon have been defined as a tumor located in the distal third of the transverse colon, the left colonic angle, the descending colon, or in the proximal third of the sigmoid colon. In addition, patients with rectosigmoid tumors who had received neoadjuvant therapy, or had not undergone loop ileostomy, were included in this study. Patients were evaluated for QOL, complications of surgery and mortality rate throughout 6 months after surgery based on a self-made model. The study questionnaire was self-made and its validity and reliability were confirmed by 6 experts in colorectal surgery.

In case of patients' lack of co-operation in completing the data, we tried to gain patients' trust by fully explaining the aims of the study and the benefits it can potentially bring to the patients. Side effects included: diarrhea, vomiting, wound infection, sepsis, obstruction, and anastomotic leaks. According to studies, diarrhea is defined as" passage of loose or watery stools occurring three or more times in 24 *hr* which means an increased frequency or decreased consistency of bowel movements" (11), which is divided into three categories according to severity, including: "low (1-5 stools/day), medium (6-9 stools/day), and high (=>10 stools/day)" (12). If the surgical site has any of the following characteristics, it is considered a wound infection: Cellulitis, abscess, stinky smell, discoloration, delayed repairing, discharge (either serous or purulent), the existence of pain or tenderness. Intestinal obstruction is characterized by a set of signs and symptoms, including abdominal pain, nausea and vomiting and obstipation, and signs such as abdominal distension and tenderness. The most common cause of intestinal obstruction is adhesions from abdominal surgery (13). An important complication of colorectal surgery is an anastomotic leak, which can lead to severe sepsis, the requirement of ostomy, and even death, and can lead to long-term complications such as stenosis, bowel dysfunction, and decreased patient survival. Its formation depends on the surgical technique, the patient's condition, *etc*. (14).

Statistical analysis: All statistical analysis was done using IBM SPSS Statistics for Windows, version 26 (IBM Corp., Armonk, N.Y., USA). Demographic data were presented as mean with standard deviation or crude numbers with frequency. Pearson's chi-square or Fisher's exact test were used to assessing nominal variables across groups. Mann-Whitney U test was used to assess differences of non-parametric variables between groups. p values less than 0.05 were considered statistically significant.

Table 1. Demographic data of the patients

Feature		Segmental colectomy (Number=71)	Subtotal colectomy (Number=25)	p-value
Age in years, mean (standard deviation)		50.60 (15.63)	42.54 (14.70)	0.213
Gender (Male)		34	15	0.297
Tumor's location	Distal of the transverse colon	1	4	<0.001
	Splenic flexure	4	9	
	Descending colon	6	3	
	Sigmoid colon	47	7	
	Rectum without loop ileostomy	13	2	

Table 2. Comparison of the surgical outcomes of segmental and subtotal colectomy

Feature		Segmental colectomy (Number=71)	Subtotal colectomy (Number=25)	p-value
Number of fecal excretions per day, mean (standard deviation)		48.89 (1.30)	47.40 (1.54)	0.812
Having fecal excretion per night		37	15	0.496
Time of defecation (regular)		64	20	0.187
Fecal consistency	Loose	37	14	0.456
	Normal	4	3	
	Firm	30	8	
Stool control capability		67	19	0.010
Pad usage		30	11	0.879
Differentiation between gas and feces		56	21	0.580
Feeling full disposal (yes)		3	0	0.296
The recovery time from symptoms after surgery, mean (standard deviation)		48.41 (2.89)	48.76 (3.10)	0.956
Number hospitalization days after surgery, mean (standard deviation)		48.85 (3.60)	47.52 (3.09)	0.835
Disposal again in 15 *min*		30	12	0.399
Impact of disease on the job and social performance		37	8	0.083
Readmission during the first 6 months after surgery		10	6	0.253
Reason of readmission	Surgical complication	5	4	0.515
	No connection surgery	5	2	
Side effects	Vomiting	0	1	0.563
	Wound infection	4	1	
	Obstruction	3	1	
	Anastomosis leak	1	0	
	Sepsis	1	1	
	No	62	21	
Mortality			0	0.551
Diarrhea	Mild (1-5 stools / 24 *hr*)	63	22	0.921
	Moderate (6-9stools / 24 *hr*)	8	3	
	Severe (> 10 stools / 24 *hr*)	0	0	

Results

Demographic data of the patients

Patients' demographic data are presented in table 1. Out of the 96 patients, 49 (51.04%) were male and 47 (48.93%) were female, who were similarly distributed in the two groups (p=0.297). In addition, there was no significant difference regarding age between the two groups (p=0.213). Of the 96 patients with

malignant tumors of the left colon, 13 were found in splenic flexure (13.54%), 9 of which underwent STC (69.23%) and 4 were SC (30.76%), as a result, there was a significant correlation between the location of the tumor and the type of surgical procedure ($p<0.001$). The detailed information on the location of the tumors for the type of surgical procedures, separately, is given in table 1.

Comparison of the surgical outcomes and QOL after segmental and subtotal colectomy

A comparison of surgical outcomes and QOL in each type of surgical procedure is presented in table 2. Of the retrieved outcome data, only one item, stool control capability, showed a significant difference in STC compared to SC ($p=0.010$) (Table 2). Other items which were not significantly different between the two surgical methods, included: having fecal excretion per night ($p=0.496$), fecal incontinence ($p=0.456$), regular times of defecation ($p=0.187$), the number pads of used ($p=0.879$), differentiation between gas and feces ($p=0.580$), feeling full defecation ($p=0.296$), having to defecate again in 15 minutes ($p=0.399$), the impact of surgery on the job and social performance ($p=0.083$), hospitalization after surgery (quantified in days), readmission within the first 6 months after surgery ($p=0.253$), recovery time (based on symptoms) after surgery ($p=0.515$), mortality within 6 months ($p=0.551$), and other side effects ($p=0.563$). Mortality rate within 6 months was 1.041% in STC, while it was 0% in SC. There was no significant difference between mortality rates based on the type of surgical technique. The details of the other mentioned variables are given in table 2. One of the assessed variables was readmission, which was not significantly different between the groups ($p=0.515$). An important complication of the surgery is anastomosis leakage, which we have fully explained in this study. The full details of the other complications of the two surgical procedures are presented in table 2. In general, of 96 patients undergoing the two surgical procedures in this study, there was one case of anastomosis leakage, which belonged to the SC group, constituting 7.69% of the patients undergoing SC surgery. Statistically, anastomosis leakage was not significantly different between the two methods ($p=0.563$).

Discussion

In this retrospective multi-centric study, we compared the postoperative complications, mortality rate and QOL (assessed by defecation frequency per day, having fecal excretion during night sleep, regular time of defecation, fecal incontinence, stool control capability, diarrhea, *etc*.) (Table 2) in two groups of patients who were operated for malignant tumors of the left colon, neither by STC nor SC. These groups showed a significant difference only in stool control capability. No significant difference was found between the two methods in terms of postoperative complications, such as anastomosis leakage, sepsis, and other outcomes.

Two methods currently used for treating malignant tumors of the left colon include STC and SC, which, according to the studies so far, have no prioritization over each other. Due to the high prevalence of malignant left colon tumors constituting 3-8% of total colon tumors, and the fact that these tumors can only definitively be treated by surgery, the importance of this study is quite understandable (1,11,12,15). One study was conducted in patients with splenic flexure cancers, which examined the clinicopathological characteristics and the type of surgical treatments including LHC *vs.* STC applied in these patients. In the mentioned study, no difference was found in the results of the surgery methods and thus hemicolectomy was the preferred treatment due to being less invasive (10). However, in our study, the outcomes of SC and STC surgeries, including mortality, complications such as wound infection and QOL after surgery, were not significantly different. According to the study by You *et al*, which investigated the functional outcomes and QOL after extended colectomy based on the level of the anastomosis the only significant difference was in defecation frequency per night and day, and other outcomes did not differ between the two methods (16). Importantly, QOL after surgery was assessed in this study and was compared between SC and extended colectomy based on the type of surgery, which was overall higher in SC (16), while in our study, these two surgical methods showed statistically equal results, except for one item (stool control capability), which was higher in SC. According to Hajibandeh *et al*, there is no significant difference between extended Right Hemicolectomy (RHC), LHC, and SC in postoperative complication and mortality in splenic flexure tumors

(17). It should be noted that recently a multi-centric study was conducted by Marc Beisani *et al*, which only examined postoperative complications and mortality rate and did not assess QOL. This study revealed only significantly higher rates of postoperative ileus, in the patients operated by the STC procedure and no significant difference was observed in mortality rate (9). Furthermore, we tried to eliminate the limitations and shortcomings of the previous studies by taking into account postoperative QOL.

This study was aimed at determining the optimal surgical technique for treating left colon tumors. In fact, in the present study, we aimed to achieve this goal by comparing postoperative complications, QOL, and mortality rates in patients treated by these two methods. Based on the results, the only significant difference was stool control capability, which was higher in SC (p=0.010). The limitations of our study include data collection challenges such as incomplete records of some patients and patients' unresponsiveness to the telephone calls for completion of the data. If the patients' records were incomplete or unavailable, the patient was excluded from the study, which might have caused a systematic error in this study. One of the most important limitations of this study is the small sample size, which was due to the exclusion criteria we had set. Furthermore, among long-term postoperative complications, the only mortality rate has been investigated in this study and other important outcomes such as recurrence rates of the tumor have not been investigated.

One of the other limitations of our study is that it is retrospective since it is time-consuming. It should be noted that future studies should be conducted prospectively. Another limitation of our research is merging the data from multiple centers as well as operations by different surgeons and surgical teams. Moreover, the emergency and elective surgery settings have not been separately investigated in this study. Of course, the number of studies in this field is quite low, and the present study, despite these limitations, is of great novelty. We hope that future studies can overcome such limitations and provide more robust results. Based on previous studies and the current study, it can be concluded that the surgeon must decide on the type of surgery based on the patient's conditions and preferences so that the outcome gives more satisfaction to the patient. We, the authors of this article, suggest that due to the increased risk for recurrence of colon tumors in patients who have undergone SC surgery, STC might be preferred as with this type of surgery, a follow-up colonoscopy is not required. Actually, in STC, follow-up is performed with rectosigmoidoscopy. However, if the patients prefer not to risk losing stool control capability, SC can be the treatment of choice. Overly, according to the results of the study, there is no difference between the two methods.

Conclusion

There was no significant difference between the two surgical procedures regarding postoperative complications and quality of life.

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Ethical approval

This study has been approved by the ethics committee. The ethics code is IR.TUMS.SINAHOSPITAL.REC.1399.022. Patients entered the study with informed consent, without coercion and voluntarily.

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