





Retrospective Study of Surgical Outcome and Predictive Factors for Anastomotic Complications after Laparoscopic Colectomy at South Egypt Cancer Institute

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Abstract:

Background: Colorectal cancer is the second- and third-most common cancer in men and women. In general, colorectal cancer is the third-most common cancer in both male and female. After exclusion of non-melanoma skin cancer accounts it accounts for 9.7% of all cancers. Developed countries account for more than half of the cases. The main curative treatment for non-metastasized CRC is the surgery. Today, colectomy using laparoscopy is considered effective and safe procedure regarding oncologic, short and long term outcomes. Several trials confirm safety and feasibility of laparoscopy in colorectal surgeries. Laparoscopic technique has many advantages as reduction of postoperative pain and operative blood loss. The incidence of anastomotic leakage after colectomy is about 5% - 6%. Anastomotic leakage usually associated with high morbidity and mortality after colonic resection.

Objective: To evaluate surgical outcome and anastomotic complications after laparoscopic colectomy as regards to treatment results in South Egypt Cancer Institute (SECI) in the period from 1/2014 to 12/2019.

Patients and Methods: This thesis is a retrospective study of colon cancer to rule out the predictive factors for anastomotic complications and surgical outcomes in laparoscopic colectomy among patients with cancer colon in the period from 1/2014 to 12/2019. After reviewing patients files, a sample size of 40 cases of colon cancer patients that had underwent laparoscopic colectomy (14 cases of right cancer colon, 11 cases of left cancer colon, 10 cases of cancer sigmoid, 5 cases of multicentric lesion) was randomly selected from our South Egypt Cancer Institute (SECI) tumor registry during the period from 1/2014 to 12/2019.

Results: Showed no significant difference regarding hypertension, diabetes, IHD, but it showed significant results for increased incidence of complications especially anastomotic leakage with asthma low preoperative albumin(<3mg) and the overall comorbidities. Results showed no significant difference regarding grade of tumor, histology, site of the lesion or the anastomosis but there is a significant result regarding duration of operation as decrease in the duration of operation decreases the hospital stay duration. Results showed no significant difference regarding hypertension, diabetes, IHD, but it showed significant results for increase the duration of hospital stay with asthma, low preoperative albumin(<3mg) and the overall comorbidities.

Conclusion: Our studies confirm that age, performance status, duration of the operation and the patient's comorbidities (asthma, serum albumin level) can predict the incidence of the anastomotic complications postoperative and prolonged hospital stay as a consequence. On the other hand, our findings demonstrate that gender predilection, grade of the tumor, histological type of the tumor, site of the lesion and technique of anastomosis had no effect neither on the incidence of anastomotic complications nor the hospital stay duration.

Keywords: Laparoscopy, colectomy, laparoscopic colectomy, anastomotic complications.

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Introduction:

Colorectal cancer is the second- and third-most common cancer in men and women. In 2012, 746,000 men (10.0% of new cancer cases) and 614,000 women (9.2% of all new cancer cases) were reported to have colorectal cancer worldwide. In general, colorectal cancer is the third-most common cancer in both male and female. After exclusion of non-melanoma skin cancer accounts it accounts for 9.7% of all cancers. Developed countries account for more than half of the cases. In females, the age standardized rate incidence (ASRI) of colorectal cancer is (14.3/100,000 individuals) lower than that in males (20.6/100,000). Age incidence of sporadic colorectal cancer are >50 years, with 80% of patients with cancer colon and 75% of rectal cancer patients being ≥ 60 years of age at the time of diagnosis. [1]

Carcinoma of colon and rectum is a lethal and common disease. Environmental and genetic factors are the risks which are affecting development of colorectal carcinoma. [2]

The main curative treatment for non-metastasized CRC is the surgery. However, quality of surgery strongly affect the outcome of treatment. [3,4]

Today's, colectomy using laparoscopy is considered effective and safe procedure regarding oncologic, short and long term outcomes.[5] Several trials confirm safety and feasibility of laparoscopy in colorectal surgeries. [6-9] Laparoscopic technique has many advantages as reduction of postoperative pain and operative blood loss. The incidence of anastomotic leakage after colectomy is about 5% - 6%. [10] Anastomotic leakage usually associated with high morbidity and mortality after colonic resection. [11] Regarding definition of anastomotic leakage there is no clear agreement on it, but we can define it as disruption (breakdown) in the junction (anastomotic line) between two hollow viscera (with or without active leak of the luminal contents). [12]

Aim of the work:

This study aims to evaluate surgical outcome and anastomotic complications after laparoscopic colectomy as regards to treatment results in South Egypt Cancer Institute (SECI) in the period from 1/2014 to 12/2019.

Patients and Methods:

Type of the study:

This thesis is a retrospective study of colon cancer to rule out the predictive factors for anastomotic complications and surgical outcomes in laparoscopic colectomy among patients with cancer colon in the period from 1/2014 to 12/2019

After reviewing patients files, a sample size of 40 cases of colon cancer patients that had underwent laparoscopic colectomy (14 cases of right cancer colon, 11 cases of left cancer colon, 10 cases of cancer sigmoid, 5 cases of multicentric lesion) was randomly selected from our South Egypt Cancer Institute (SECI)

tumor registry during the period from 1/2014 to 12/2019.

The inclusion criteria included those patients diagnosed with stage I to stage IV colon cancer at 18 years old or above between 1/2014 and 12/2019.

The exclusion criteria were as follows: Patients below 18 years old, patient refusal and unfit for surgery, Patients with mental problems, Patients with peritoneal metastatic disease from the start and Patients with recurrent cancer colon.

In each case we extracted the following data, age of the patient, performance status at time of surgery, stage of disease at time of diagnosis, comorbidities that may affect the anastomosis, histological grade of the disease, site of the lesion (right, left, sigmoid or multicentric), surgical technique of anastomosis (stapler or hand sewing) and the operation done.

Sample size calculation:

The sample was calculated by using G power version 3.1. Based on a study done by (John Emerson Scarborough December 2018).

Statistical Analysis:

Statistical analysis was done using SPSS program version 20. Descriptive analyses were used to estimate the prevalence of the different groups. Comparisons between different groups were performed using the chi-square test or Fisher's exact test for categorical data.

Ethical Consideration:

The data (both paper and electronic) will be stored to safeguard confidentiality. The study was conducted according to Ethical Committee rules at South Egypt Cancer Institute.

Results:

In the period from January 2014 to December 2019, we studied 40 patients (20 males and 20 females) who underwent laparoscopic colectomy with mean age 52.98 ± 14.51 years; table 1. According to performance, patients had nearly the same distribution between poor, fair and good. 75.0% of patients had normal preoperative albumin level. 16 (40.0%) patients had comorbidities (hypertension 27.5%, D.M 17.5, IHD 7.5% and asthmatic 7.5); Patients may have one or more than one comorbidity.

In table 2, according to site of the tumor right colon came first 37.5% followed by left colon, sigmoid, multicentric and lastly the transverse colon (27.5%, 25%, 7.5% and 2.5% respectively. According to histology most of cases were moderately differentiated (35%), benign tumors represented 5% in the form of multiple villus and tubulovillous polyps distributed in all of the colon. High grade tumors represented 44.73% followed by intermediate (34.21%) and low grade tumors (21.06%). Most of cases underwent hand sewing anastomosis (85.0%). According to duration of operation, easy operation (≤ 4 hours) was the most common (77.5%). Ten patients (25.0%) had

postoperative complications; the most common were bleeding 10(25.0%); six patients had anastomotic line bleeding and were treated conservatively except 2 patients who were treated by exploration also for anastomotic leakage. The other four patients had bleeding from the mesentery; 2 of them treated conservatively while the other 2 were treated successively with angioembolization), anastomotic leakage 6(15.0%); three of them had low output fistula and were treated conservatively the other three patients were in need for reexploration) and wound complications 6(15.0%) as infection and dehiscence followed by anemia (7.5% due to bleeding). Patients may have more than one complication. Median hospital stay was 12 days (range 7-45 days) with most of patients had average stay (≤ 15 days). Patients having long hospital stay mostly due to anastomotic leakage and chest complications. Wound infection was treated by antibiotics, anti-inflammatory and repeated dressing, only 3 patients were in need for 2ndry sutures.

In table 3, where we discussed the association between patients characteristics and incidence of complications, Results showed no significant correlation with age and gender but significance was between poor performance as regarding to increase incidence of complications ($P = 0.016$). Results showed no significant difference regarding hypertension, diabetes, IHD, but it showed significant results for increased incidence of complications with asthma, low preoperative albumin ($< 3\text{mg}$) and the overall comorbidities (P was 0.01, < 0.001 and 0.025 respectively).

Table (1) Characteristics of 40 patients in the study undergoing laparoscopic colectomy at south Egypt cancer institute

Characteristic	N	%
Gender		
- Male	20	50.0%
- Female	20	50.0%
Age		
• 20-39	10	25.0%
• 40-59	14	35.0%
• 60-80	16	40.0%
Performance		
• Poor	14	35.0%
• Fair	12	30.0%
• Good	14	35.0%
Preoperative albumin level		
- ≥ 3.5 (normal)	30	75.0%
- < 3.5 (low)	10	25.0%
Comorbidity		
- Hypertension	11	27.5.0%
- Diabetes	7	17.5%
- Ischaemic heart disease	3	7.5%
- Asthmatic	3	7.5%

Table (2) Tumor and procedure-related Characteristics

Characteristic	N	%
Grade of malignant tumors(n=38)		
• Low grade	8	21.05%
• Intermediate grade	13	34.21%
• High grade	17	44.73%
Histology		
- Benign	2	5.0%
- Mucinous	8	20.0%
- Poorly	9	22.5%
- Moderate	14	35.0%
- Well	7	17.5%
Site of lesion		
- Right colon	15	37.5%
- Transverse colon	1	2.5%
- Left colon	11	27.5%
- Sigmoid	10	25.0%
- Multi centric	3	7.5%
Anastomosis		
• Hand sewing	34	85.0%
• Stapler	6	15.0%
Duration of operation		
• Easy operation (≤ 4 hours)	31	77.5%
• Difficult operation(> 4 hours)	9	22.5%
Postoperative complications		
• Anastomotic leakage	6	15.0%
• Ileus	1	2.5%
• Pulmonary complication	2	5.0%
• UTI	1	2.5%
• Anemia	3	7.5%
• Poor oral intake	1	2.5%
• Persistent diarrhea	1	2.5%
• Bleeding	10	25.5%
• Wound complications	6	15.0%
Hospital stay		
- Average stay (≤ 15 days)	30	75.0%
- Prolonged stay (> 15 days)	10	25.0%

In table 4, Results showed no significant difference regarding grade of the tumor, histology, site of the lesion or the anastomosis but there is a significant result regarding duration of operation as decrease in the duration of operation decreases the incidence of complications ($P < 0.001$).

In table 5, Results showed no association between the patient characteristics and incidence of anastomotic leakage. Results showed no significant difference regarding hypertension, diabetes, IHD, but it showed significant results for increased incidence of complications especially anastomotic leakage with asthma, low preoperative albumin ($< 3\text{mg}$) (P was 0.05 and < 0.001 respectively).

In table 6, Results showed no significant difference regarding grade of tumor, histology, site of the lesion or the anastomosis but there was significant result regarding duration of operation as decrease in the

duration of operation decreases the incidence of anastomotic leakage ($P=0.001$).

In table 7, Results showed relationship between the patient Characteristics especially the performance status of the patient and increased hospital stay where poor performance showed significant increase in the hospital stay duration ($P=0.016$). Results showed no significant difference regarding hypertension (but there was tendency to increase hospital stay in hypertensive patients, $P=0.079$), diabetes, IHD, but it showed significant results for increase the duration of hospital stay with asthma, low preoperative albumin($<3\text{mg}$) and the overall comorbidities (P was 0.016, 0.012, <0.001 and 0.032 respectively).

In table 8, on discussing the association between hospital stay duration and tumor and procedure-related Characteristics; there was a significant result regarding duration of operation as decrease in the duration of operation decreases the hospital stay duration (P was <0.001).

Results in table 9 showed significant increase in the hospital stay (more than 15 days) with increased incidence of anastomotic leakage, anaemia, bleeding, wound complications and the incidence of overall complications (P was <0.001 , 0.012, <0.001 , 0.034 and <0.001 respectively). Also there is tendency of significant correlation with pulmonary complications ($P=0.058$).

Discussion:

Colon cancer (CC) is the third most frequent cancer worldwide and ranks as the fourth leading cause of death from cancer. Several studies were done worldwide in an attempt to demonstrate the predisposing factors of anastomotic complications after laparoscopic colectomy.

As regards to the gender, our study did not demonstrate any significant difference between male and female in the incidence of leakage. This result was in agreement with the study by Sang Hum Jung and colleagues which reported that "There is no significant percentage of incidence in male or female.[13] But this was not agree with Hamabe et al where there was male predominance.[14-17]

As regards to the age incidence, our study demonstrated that there is significant difference in the incidence of anastomotic complications in older ages as the second and third group (40-59 yrs) and (60 – 80 yrs) respectively, which was in agreement with the study by William H. and colleagues which reported that "The mean age for incidence of leakage is 47 years with range from 21 to 75 years".[18] and other studies. [19][20] Other studies showed no significant correlation between age and anastomotic leakage. [21-23]

As regards performance status, our study demonstrated that there is significant association between the incidence of anastomotic complications and the overall general condition of the patient, which increase obviously in the fair and poor groups unlike the good groups in which it decreases dramatically. That was in agreement with the study done by Antonio S.

and colleagues which reported that "leak rate increases in patients that are in poor performance status and haemodynamically unstable".[24] But in a study done by Thibault et al, 2018; they did not found this significant correlation.[25]

As regards to the grade of the tumor, our study demonstrated that there is no association between the grade of the tumor and the anastomotic leakage, which is in agreement with the study done by L.srinivas et al which ensured our results.[26] But this is in contrast with the study done by Ik YongKim and his colleagues which reported that "high grade tumors have higher incidence of leakage than low grade tumors".[27]

As regards to the histological type of the tumor, our study demonstrated that there is no difference between the occurrence of anastomotic leakage and the histological differentiation of the tumor in agreement with Zhi-Jie Wang and Qian Liu.[28] but in contrast with the study done by Kirchhoff P and colleagues which reported that "poorly and mucinous differentiation of tumor is a highly predictive factor for anastomotic leakage after colectomy".[29]

As regards to the site of the lesion, our study demonstrated that there is no association between the site of the lesion and the anastomotic leakage, which is in agreement with the study done by Zhi-Jie Wang and Qian which concluded that "the site of the lesion does not have any effect on the anastomotic complications following colon cancer surgeries.[28] But this is in contrast with the study done by C S McArdle and colleagues which reported that "rectum and rectosigmoid colon have the highest frequency rate of anastomotic leakage after colon surgeries rather the other parts of the colon.[21]

As regards to the technique of the anastomosis, our study demonstrated that there is no obvious relationship between the anastomotic leakage and the technique of the anastomosis, which was in agreement with the study done by Michael J. Stamos and others who concluded that; With regards to anastomotic leak, stapled anastomoses have been shown to have equivalent outcomes to handsewn in most series.[30] But it was against the study done by Jongen AC and others which concluded that the stapler technique is less likely to anastomotic leakage than handsewn.[31]

As regards to Duration of the operation, our study demonstrated that prolonged operative time almost associated with anastomotic complications and surgical problems rather than short operative time, which is in agreement with the study done by Sciuto and others which concluded that "Prolonged operations may reflect intraoperative difficulties especially in critical patients.[32]

As regards to the comorbidities, our study revealed that (diabetes, hypertension and ischemic heart disease) had no significant relation with the anastomotic complications and no relation also with hospital stay, which was in agreement with the study done by Peter-Martin Krarup and others which concluded that "comorbidities as hypertension, diabetes and IHD failed to predict anastomotic leakage or prolonged hospital stay.[33]

Table (3) Association between complications and patients Characteristics

		Complication				p-value
		No		Yes		
		N	%	N	%	
Gender	Male	14	70.0%	6	30.0%	0.46
	Female	16	80.0%	4	20.0%	
Age	20-39	9	90.0%	1	10.0%	0.42
	40-59	9	64.3%	5	35.7%	
	60-80	12	75.0%	4	25.0%	
Performance	Poor(2)	8	57.1%	6	42.9%	0.016
	Fair(1)	8	66.7%	4	33.3%	
	Good(0)	14	100.0%	0	0.0%	
Hypertension	No	24	82.8%	5	17.2%	0.06
	Yes	6	54.5%	5	45.5%	
Diabetes	No	26	78.8%	7	21.2%	0.23
	Yes	4	57.1%	3	42.9%	
Ischemic heart disease	No	29	78.4%	8	21.6%	0.14
	Yes	1	33.3%	2	66.7%	
Asthma	No	30	81.1%	7	18.9%	0.01
	Yes	0	0.0%	3	100.0%	
Preoperative albumin	≥3.5(normal)	30	75.0%	0	100.0%	<0.001
	<3(low)	0	0.0%	10	0.0%	
Comorbidity	No	21	87.5%	3	25.0%	0.025
	Yes	9	56.3%	7	12.5%	

Table (4) Association between complications and tumor and procedure-related Characteristics

		Complication				P-value
		No		Yes		
		N	%	N	%	
Grade of tumor	Low grade	5	62.5%	3	37.5%	0.59
	Intermediate grade	11	84.6%	2	15.4%	
	High grade	12	70.6%	5	29.4%	
Histology	Benign	2	100.0%	0	0.0%	0.66
	Mucinous	5	62.5%	3	37.5%	
	Poorly	6	66.7%	3	33.3%	
	Moderate	12	85.7%	2	14.3%	
	Well	5	71.4%	2	28.6%	
Site of lesion	Right colon	12	80.0%	3	20.0%	0.74
	Transverse colon	1	100.0%	0	0.0%	
	Left colon	7	63.6%	4	36.4%	
	Sigmoid	7	70.0%	3	30.0%	
	Multi centric	3	100.0%	0	0.0%	
Anastomosis	Hand sewing	26	76.5%	8	23.5%	0.62
	Stapler	4	66.7%	2	33.3%	
Duration of operation	Easy operation (<=4 hours)	30	96.8%	1	3.2%	<0.001
	Difficult operation (>4ours)	0	0.0%	9	100%	

Table (5) Association between anastomotic leakage and patients Characteristics

		Anastomotic leakage				P - value
		No		Yes		
		N	%	N	%	
Gender	Male	17	85.0%	3	15.0%	1.00
	Female	17	85.0%	3	15.0%	
Age	20-39	9	90.0%	1	10.0%	0.8
	40-59	12	85.7%	2	14.3%	
	60-80	13	81.3%	3	18.8%	
Performance	Poor(2)	11	78.6%	3	21.4%	0.13
	Fair(1)	9	75.0%	3	25.0%	
	Good(0)	14	100.0%	0	0.0%	
Hypertension	No	26	89.7%	3	10.3%	0.31
	Yes	8	72.7%	3	27.3%	
Diabetes	No	28	84.8%	5	15.2%	1.00
	Yes	6	85.7%	1	14.3%	
Ischemic heart disease	No	32	86.5%	5	13.5%	0.39
	Yes	2	66.7%	1	33.3%	
Asthma	No	33	89.2%	4	10.8%	0.05
	Yes	1	33.3%	2	66.7%	
Preoperative albumin	≥3.5(normal)	30	100%	0	0.0%	<0.001
	<3(low)	4	40.0%	6	60.0%	
Comorbidity	No	22	91.7%	2	8.3%	0.19
	Yes	12	75.0%	4	25.0%	

Table (6) Association between anastomotic leakage and tumor and procedure-related Characteristics

		Anastomotic leakage				`p-value
		No		Yes		
		N	%	N	%	
Grade of tumor	Low grade	7	87.5%	1	12.5%	0.7
	Intermediate grade	12	92.3%	1	7.7%	
	High grade	13	76.5%	4	23.5%	
Histology	Benign	2	100.0%	0	0.0%	0.4
	Mucinous	5	62.5%	3	37.5%	
	Poorly	8	88.9%	1	11.1%	
	Moderate	13	92.9%	1	7.1%	
	Well	6	85.7%	1	14.3%	
Site of lesion	Right colon	14	93.3%	1	6.7%	0.28
	Transverse colon	1	100.0%	0	0.0%	
	Left colon	7	63.6%	4	36.4%	
	Sigmoid	9	90.0%	1	10.0%	
	Multi centric	3	100.0%	0	0.0%	
Anastomosis	Hand sewing	29	85.3%	5	14.7%	0.9
	Stapler	5	83.3%	1	16.7%	
Duration of operation	Easy operation (<=4 hours)	30	96.8%	1	3.2%	0.001
	Difficult operation(>4hours)	4	44.4%	5	55.6%	

Table (7) Association between hospital stay and patients Characteristics

		Hospital stay				P - value
		Average stay (≤15 days)		Prolonged stay (>15 days)		
		N	%	N	%	
Gender	Male	14	70.0%	6	30.0%	0.46
	Female	16	80.0%	4	20.0%	
Age	20-39	9	90.0%	1	10.0%	0.42
	40-59	9	64.3%	5	35.7%	
	60-80	12	75.0%	4	25.0%	
Performance	Poor	8	57.1%	6	42.9%	0.016
	Fair	8	66.7%	4	33.3%	
	Good	14	100.0%	0	0.0%	
Hypertension	No	24	82.8%	5	17.2%	0.079
	Yes	6	54.5%	5	45.5%	
Diabetes	No	26	78.8%	7	21.2%	0.23
	Yes	4	57.1%	3	42.9%	
Ischemic heart disease	No	29	78.4%	8	21.6%	0.14
	Yes	1	33.3%	2	66.7%	
Asthma	No	30	81.1%	7	18.9%	0.012
	Yes	0	0.0%	3	100.0%	
Pre-operative albumin	≥3.5 (normal)	30	100.0%	0	0.0%	<0.001
	<3 (low)	0	0.0%	10	100.0%	
Comorbidity	No	21	87.5%	3	12.5%	0.032
	Yes	9	56.3%	7	43.8%	

Table (8) Association between hospital stay duration and tumor and procedure-related Characteristics

		Hospital stay				p- value
		Average stay (<= 15 days)		Prolonged stay (>15 days)		
		N	%	N	%	
Grade of tumor	low grade	5	62.5%	3	37.5%	0.56
	intermediate grade	11	84.6%	2	15.4%	
	high grade	12	70.6%	5	29.4%	
Histology	benign	2	100.0%	0	0.0%	0.66
	mucinous	5	62.5%	3	37.5%	
	poorly	6	66.7%	3	33.3%	
	moderate	12	85.7%	2	14.3%	
	Well	5	71.4%	2	28.6%	
Site of lesion	right colon	12	80.0%	3	20.0%	0.74
	transverse colon	1	100.0%	0	0.0%	
	left colon	7	63.6%	4	36.4%	
	sigmoid	7	70.0%	3	30.0%	
	Multi centric	3	100.0%	0	0.0%	
Anastomosis	hand sewing	26	76.5%	8	23.5%	0.47
	Stapler	4	66.7%	2	33.3%	
Duration of operation	easy operation (<= 4hours)	30	96.8%	1	3.2%	<0.001
	difficult operation(>4 hours)	0	0.0%	9	100.0%	

Table (9) Association between hospital stay and complications

		Hospital stay				p- value
		Average stay (≤15 days)		Prolonged stay (>15 days)		
		N	%	N	%	
Anastomotic leakage	No	30	88.24%	4	11.760%	<0.001
	Yes	0	0.0%	6	100,0%	
Ileus	No	30	77.0%	9	23.0%	0.25
	Yes	0	0.0%	1	100.0%	
Pulmonary complication	No	30	79.0%	8	21.0%	0.058
	Yes	0	0.0%	2	100.0%	
UTI	No	30	77.0%	9	23.0%	0.25
	Yes	0	0.0%	1	100.0%	
Anemia	No	30	81.0%	7	19.0%	0.012
	Yes	0	0.0%	3	100.0%	
Poor oral intake	No	30	77.0%	9	23.0%	0.25
	Yes	0	0.0%	1	100.0%	
Persistent diarrhea	No	30	77.0%	9	23.0%	0.25
	Yes	0	0.0%	1	100.0%	
Bleeding	No	30	100.0%	0	0.0%	<0.001
	Yes	0	0.0%	10	100.0%	
Wound complications	No	29	85.3%	5	14.7%	0.0344
	Yes	1	16.7%	5	83.3%	
Complication	No	30	100.0%	0	0.0%	<0.001
	Yes	0	0.0%	10	100.0%	

But with other comorbidities like bronchial asthma and the level of serum albumin, our study revealed that low serum albumin level and bronchial asthma increase obviously the incidence of anastomotic complications and eventually prolonged hospital stay, which was in agreement with the study done by Shimura and others which reported that “Lower early preoperative serum albumin levels are a potentially valuable indicator of anastomotic leakage in CRC patients undergoing curative surgery.[34]

As regards to the postoperative complications and the hospital stay period, our study revealed significant relation between anastomotic leakage, anemia, bleeding and wound complications with prolonged hospital stay, which was in agreement with the study done by Andrew Schiff and others which reported that “the development of post-operative anastomotic leak is one of the most concerning complications in colorectal resection surgery as it is associated with prolonged hospital stays.[35]

Conclusion:

Our studies confirm that age, performance status, duration of the operation and the patient's comorbidities (asthma, serum albumin level) can predict the incidence of the anastomotic complications and prolonged hospital stay as a consequence. On the other hand, our findings demonstrate that gender predilection, grade of the tumor, histological type of the tumor, site of the lesion and technique of anastomosis had no effect neither on the incidence of anastomotic complications nor the hospital stay duration.

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