Risk Factors and Outcomes of Occurrence of Anastomotic Leakage and Reoperations for its Management after Colorectal Surgery

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Abstract

Background Anastomotic leakage (AL) is still the most annoying postsurgery complication after colorectal resection due to its serious complications up to death. Limited data were available regarding differences in AL incidence, management, and consequences for different types of colorectal resection.

The aim of the present work was to evaluate differences in incidence of AL, incidence of postoperative complications, and length of hospital stay in a large number of patients who underwent elective colorectal resection for management of colorectal lesions. In addition to detect when and what type of reoperation for management of AL occur after colorectal resection.

Patients All 250 included patients underwent elective surgeries for colorectal resection with performance of primary anastomosis for management of colorectal neoplastic and non-neoplastic diseases in the period between May 2016 and July 31, 2021.

We followed the patients for 90 days; we registered the follow-up findings.

Results the rates of AL occurrence were variable after the different procedures. The lowest rate of AL occurrence was found in patients who underwent right hemicolectomy, then in patients who underwent sigmoidectomy, left hemicolectomy, transversectomy and anterior resection ($p = 0.004$). A stoma was frequently performed during reoperation (79.5%) which was significantly different between different procedures: 65.5% in right hemicolectomy, 75.0% in transversectomy, 85.7% in left hemicolectomy, and 93.0% in sigmoid resection ($p < 0.001$).

Keywords
- colorectal resection
- anastomotic leakage
- stoma

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Conclusion Rates, types, time of occurrence and severity of AL vary according to the type of colectomy performed and selective construction of stoma during AL reoperation is currently safely applied with comparable mortality rates for patients who did and who did not have a stoma after reoperation.

Introduction

Anastomotic leakage (AL) is still the most annoying postsurgery complication after resection of colon cancer due to its serious consequences such as sepsis and mortality.[1,2] Anastomotic leakage is mostly diagnosed after surgery by $\sim$ 2 weeks.[3,4] Anastomotic leakage often needs surgical reintervention by performing reoperation with stoma creation.[1,2] Additionally, rates of AL, reoperation, and postoperative outcomes differ according to sites of anastomosis.[5,6]

It was found that AL after rectal surgery has higher incidences than that after colon surgery, but AL incidence after performing different types of colectomies occurs earlier with higher complications than AL after rectal surgery.[6] This is because the location of the resection and the anastomosis are intra-peritoneal in case of colon resection rather than extra-peritoneal location in case of rectal surgery.[7]

Moreover, regarding the anatomical site of colon resection, it was demonstrated that AL, infection, and other complications are more common in left colectomy in comparison with right colectomy (RC).[8]

Assessment of detailed surgical outcomes, AL, and complications according to the anatomical location of colorectal resection have been infrequently studied. Moreover, limited data were available regarding differences in AL incidence, management, and consequences for different types of colorectal resection.[9]

The aim of the present work was to evaluate differences in the incidence of AL, the incidence of postoperative complications, and length of hospital stay in a large number of patients who underwent elective colorectal resection for management of colorectal cancer, in addition to detect when and what type of reoperation for management of AL occur after colorectal resection.

Patients

All included patients underwent elective surgeries for colorectal resection with performance of primary anastomosis for the management of colorectal neoplastic and non-neoplastic diseases in the period between May 2016 and July 31, 2021.

We extracted patients' data such as age, sex, ASA classification, comorbidities, body mass index (BMI), tumor findings, preoperative laboratory findings, surgical intraoperative results, 30-day postoperative outcomes, and follow-up information such as occurrence of superficial surgical site infection (SSI), deep incisional SSI, organ space SSI, 30-day mortality, and occurrence of AL.

We followed the patients for 90 days; we registered the 30-day and 90-day follow-up findings.

Patients and Surgical Outcomes

The surgically performed procedures were: right hemicolectomy, transverse colon resection, left hemicolectomy, sigmoidectomy, and anterior resection of the rectum.

We defined AL as the presence of any intestinal wall defect or presence of an abscess at the colorectal anastomosis site that required reoperation for its management within 30 to 90 days from the primary colorectal resection.

We report the follow-up findings from the time of performing colectomy to the time of reoperation.

Reinterventions were divided into: (1) open surgical reintervention, and (2) nonsurgical reintervention as radiologic reintervention.

We reported AL occurrence, time and type of reintervention for each type of colectomy.

After reoperation, we recorded primary outcomes such as intensive care unit (ICU) admission, mortality, and construction of stoma, and we recorded secondary outcomes such as prolonged duration of hospital stay of >14 days, hospital readmission, and creation of a stoma.

Exclusion Criteria

Patients with emergency resections, patients without performed primary anastomosis, patients with a previous stoma as bridge to surgery without reversal during the elective colectomy, patients with incomplete clinical data on AL, patients with performed total proctocolectomy, patients who underwent abdominoperineal resection, preoperative sepsis, major bleeding, open wound or ventilator dependence were excluded.

Outcome Definitions

We evaluated post-operative short-term outcomes as occurrence of superficial SSI.

We assessed the following major complications: deep infection at the site of incision, organ-space SSI, disruption of the surgical wound, reintubation, pneumonia, and pulmonary embolism, deteriorating renal functions, coma, cardiac arrest, sepsis, septic shock, and the need to return to the operating room.

Statistical Analyses

For patients diagnosed with AL, we reported baseline characteristics and outcomes after reoperation.

Categorical variables are assessed and compared as numbers and percentages by using the Fisher exact test or the Pearson chi-squared test. We reported continuous variables as median and range using the Kruskal-Wallis rank-sum test for the assessment of statistical significance.

We calculated the duration between primary surgical intervention and reoperation by using the date of surgeries and time of reintervention. A p-value < 0.05 was considered statistically significance.

Results

Patients

The present study included 250 patients. Sixty-eight percent of them were males. The mean age was 50.92 years old, and the mean BMI was 22.51 kg/m2.

Histopathological investigation was done for 179 patients, revealing that 16.2% had benign neoplasm. One-hundred and fifty patients had malignancy; 21.3% had stage IV, 19.3% had N stage III, and 68.7% had grade III. Tumor complications occurred in 12.7%. The commonest site of resection was the cecum. Anastomotic leakage occurred in 49 patients (19.6%) (►**Table 1**)

There is a statistically significant relation between incidence of leakage and histopathological types, T, N staging, and incidence of tumor complications.

On the other hand, there is a nonsignificant relation between incidence of leakage and either age, sex, BMI, grade, or AJCC staging.

Anastomotic Leakage and Reintervention

The rates of AL occurrence were variable after the different procedures. The lowest rate of AL occurrence was found in patients who underwent right hemicolectomies, then in patients who underwent sigmoidectomy, left hemicolectomy, transversectomy, and anterior resection ($p = 0.004$). (►**Tables 2** and **3**, ►**Figure 1**)

There is a statistically significant relation between incidence of leakage and all of ASA, type of operation, site of resection, and surgical approach.

Table 1 Distribution of patients according to baseline data:

	$n = 250$	%
Gender:		
Female	80	32%
Male	170	68%
Age (years old) *Mean* ± *SD*	50.92 ± 9.07	
BMI (kg/m^2) *Mean* ± *SD*	22.51 ± 1.31	
HPE types	$n = 179$	
Conventional adenocarcinoma	100	55.9%
Mucoid carcinoma	34	19%
Squamous cell carcinoma	16	8.9%
Benign neoplasm	29	16.2%
T stage	$n = 150$	
I	31	20.7%
II	57	38%
III	30	20%
IV	32	21.3%
N stage:	$n = 150$	
0	42	28%
I	34	22.7%
II	45	30%
III	29	19.3%
M stage (0)	150	100%
AJCC stage:		
I	25	16.7%
II	22	14.7%
III	103	68.7%
Grade:		
I	25	16.7%
II	22	14.7%
III	103	68.7%

Table 1 (*Continued*)

	***n* = 250**	**%**
Tumor complications:	*n* = 150	
Absent	131	87.3%
Present	19	12.7%
Reason for resection:		
Malignancy	150	60%
Benign	29	11.6%
Diverticula disease	16	6.4%
Obstruction	14	5.6%
Ischemia	20	8%
Coloproctitis	14	5.6%
Perforation	7	2.8%
Resection site:		
Cecum	66	26.4%
Ascending colon	38	15.2%
Transverse colon	16	6.4%
Descending colon	58	23.2%
Sigmoid colon	42	16.8%
Rectum	30	12%
ASA:		
I, II	172	68.8%
III	78	31.2%
Type of primary operation:		
Right hemicolectomy	104	41.6%
Left hemicolectomy	58	23.2%
Transverse colectomy	16	6.4%
Sigmoid colectomy	42	16.8%
Anterior resection	30	12%
Approach:		
Laparoscopic	39	15.6%
Open	211	84.4%
Anastomotic leakage:		
Absent	201	80.4%
Present	49	19.6%
Reoperation:		
Absent	223	89.2%
Present	27	10.8%
Short-term complications		
Absent	234	93.6%
Present	16	6.4%
Postoperative complications		
Absent	234	93.6%
Present	16	6.4%

Abbreviations: AJCC, American Joint Cancer Committee; ASA, American Society of Anesthesiologists; BMI, body mass index; HPE, Histopathological examination; SD, standard deviation.

Table 2 Relation between the incidence of anastomotic leakage and clinicopathological data of studied patients

	Anastomotic leakage $n = 49$	No leakage $n = 201$	χ^2/t	*p-value*
Gender:			2.555	0.11
Female	11 (22.4%)	69 (34.3%)		
Male	38 (77.6%)	132 (65.7%)		
Age (years old) *Mean ± SD*	50.1 ± *9.5*	51.11 ± *8.98*	- 0.7	0.485
BMI (kg/m^2) *Mean ± SD*	22.58 ± *1.2*	22.5 ± *1.34*	0.414	0.679
HPE types			MC	< 0.001**
Conventional adenocarcinoma	11 (29.7%)	89 (62.7%)		
Mucoid carcinoma	15 (40.5%)	19 (13.4)		
Squamous cell carcinoma	7 (18.9%)	9 (6.3%)		
Benign neoplasm	4 (10.8%)	25 (17.6%)		
T stage			13.047¥	< 0.001**
I	6 (18.2%)	25 (21.4%)		
II	1 (3%)	56 (47.9%)		
III	13 (39.4%)	17 (14.5%)		
IV	13 (39.4%)	19 (16.2%)		
N stage:			11.214¥	< 0.001**
0	6 (18.2%)	36 (30.8%)		
I	1 (3%)	33 (28.2%)		
II	14 (42.4%)	31 (26.5%)		
III	12 (36.4%)	17 (14.5%)		
M stage (0)	33 (100%)	117 (100%)	0	> 0.999
AJCC stage:	$n = 33$	$n = 117$	0.002¥	0.972
I	6 (18.2%)	19 (16.2%)		
II	4 (12.1%)	18 (15.4%)		
III	23 (69.7%)	80 (68.4%)		
Grade:	$n = 33$	$n = 117$	0.002¥	0.972
I	6 (18.2%)	19 (16.2%)		
II	4 (12.1%)	18 (15.4%)		
III	23 (69.7%)	80 (68.4%)		
Tumor complications:			5.125	0.024*
Absent	25 (75.8%)	106 (90.6%)		
Present	8 (24.2%)	11 (9.4%)		

Abbreviations: AJCC, American Joint Cancer Committee; BMI, body mass index; HPE, Histopathological examination; MC, Mucinous carcinoma; SD, standard deviation.
χ^2Chi-squared test.
¥chi-squared for trend test MC Monte Carlo test t independent sample *t*-test.
*$p < 0.05$ is statistically significant.
**$p \leq 0.001$ is highly significant statistically.

On the other hand, there is a nonsignificant relation between incidence of leakage and any reason for resection. (►**Tables 4** and **5**, ►**Figure 2**)

Reintervention was mostly surgical, ranging from 82% for transversectomy to 92% for sigmoid resection ($p < 0.001$). The median time to reoperation was significantly variable between colectomies, with the shortest time-interval to from primary operation to reoperation for sigmoid resection (4 days), followed by left and right hemicolectomy (6 days), and transverse colon resection (6 days), ($p < 0.001$).

Nonsurgical reintervention for AL management was mostly performed for patients who underwent transverse colon resection (18.8%) and right hemicolectomy (17.1%). (►**Tables 5** and **6**, ►**Figure 3**)

The median time to nonsurgical reintervention was not different between the surgical procedures.

Table 3 Relation between incidence of anastomotic leakage and preoperative data of studied patients:

	Anastomotic leakage $n = 49$	No leakage $n = 201$	χ^2	*p-value*
Reason for resection:			MC	0.392
Malignancy	33 (67.3%)	117 (58.2%)		
Benign	4 (8.2%)	25 (12.4%)		
Diverticula disease	4 (8.2%)	12 (6%)		
Others	8 (16%)	47 (23.5%)		
Resection site:			MC	$< 0.001^{*}$
Cecum	10 (20.4%)	56 (27.9%)		
Ascending colon	0 (0%)	38 (18.9%)		
Transverse colon	5 (10.2%)	11 (5.5%)		
Descending colon	20 (40.8%)	38 (18.9%)		
Sigmoid colon	8 (16.3%)	34 (16.9%)		
Rectum	6 (12.2%)	24 (11.9%)		
ASA:			60.998	$< 0.001^{**}$
I, II	11 (22.4%)	161 (80.1%)		
III	38 (77.6%)	40 (19.9%)		
Primary operation:			MC	0.004^{*}
Right hemicolectomy	10 (20.4%)	94 (46.8%)		
Left hemicolectomy	20 (40.8%)	38 (18.9%)		
Transverse colectomy	5 (10.2%)	11 (5.5%)		
Sigmoid colectomy	8 (16.3%)	34 (16.9%)		
Anterior resection	6 (12.2%)	24 (11.9%)		
Approach:			24.862	$<0.001^{**}$
Laparoscopic	19 (38.8%)	20 (10%)		
Open	30 (61.2%)	181 (90%)		

Abbreviations: AJCC, American Joint Cancer Committee; MC, Mucinous carcinoma.
χ^2Chi-squared test MC Monte Carlo test.
$^{*}p < 0.05$ is statistically significant.
$^{**}p \leq 0.001$ is highly significant statistically.

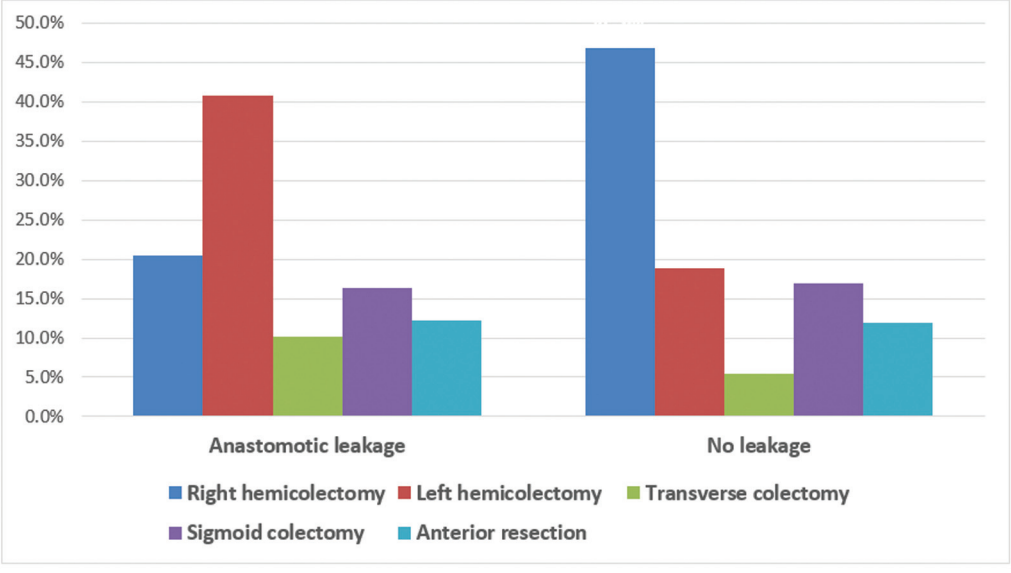

Fig. 1 Multiple bar chart showing the relation between type of operations and anastomotic leakage.

Table 4 Relation between incidence of anastomotic leakage and postoperative data of studied patients:

	Anastomotic leakage $n=49$	No leakage $n=201$	χ^2/t	*p-value*
Reoperation:			124.165	$< 0.001^{**}$
Absent	22 (44.9%)	201 (100%)		
Present	27 (55.1%)	0 (0%)		
Short term complications			Fisher	$< 0.001^{**}$
Absent	33 (67.9%)	201 (100%)		
Present	16 (32.1%)	0 (0%)		
Postoperative complications			Fisher	$< 0.001^{**}$
Absent	33 (67.9%)	201 (100%)		
Present	16 (32.1%)	0 (0%)		

χ^2Chi-squared test.

Table 5 Relation between incidence of anastomotic leakage and baseline data of studied patients

	Anastomotic leakage $n=49$	No leakage $n=201$	χ^2/t	*p-value*
Gender:			2.555	0.11
Female	11 (22.4%)	69 (34.3%)		
Male	38 (77.6%)	132 (65.7%)		
Age (years old) *Mean* ± *SD*	50.1 ± *9.5*	51.11 ± *8.98*		
BMI (kg/m^2) *Mean* ± *SD*	22.58 ± *1.2*	22.5 ± *1.34*		
HPE types			MC	$< 0.001^{**}$
Conventional adenocarcinoma	11 (29.7%)	89 (62.7%)		
Mucoid carcinoma	15 (40.5%)	19 (13.4)		
Squamous cell carcinoma	7 (18.9%)	9 (6.3%)		
Benign neoplasm	4 (10.8%)	25 (17.6%)		
T stage			13.047	$< 0.001^{**}$
I	6 (18.2%)	25 (21.4%)		
II	1 (3%)	56 (47.9%)		
III	13 (39.4%)	17 (14.5%)		
IV	13 (39.4%)	19 (16.2%)		
N stage:			11.214	$< 0.001^{**}$
0	6 (18.2%)	36 (30.8%)		
I	1 (3%)	33 (28.2%)		
II	14 (42.4%)	31 (26.5%)		
III	12 (36.4%)	17 (14.5%)		
M stage (0)	33 (100%)	117 (100%)	0	> 0.999
AJCC stage:	N = 33	N = 117	0.002	0.972
I	6 (18.2%)	19 (16.2%)		
II	4 (12.1%)	18 (15.4%)		
III	23 (69.7%)	80 (68.4%)		
Grade:	*n* = 33	*n* = 117	0.002	0.972
I	6 (18.2%)	19 (16.2%)		
II	4 (12.1%)	18 (15.4%)		
III	23 (69.7%)	80 (68.4%)		

Table 5 (*Continued*)

	Anastomotic leakage $n = 49$	No leakage $n = 201$	χ^2/t	*p-value*
Tumor complications:			5.125	0.024*
Absent	25 (75.8%)	106 (90.6%)		
Present	8 (24.2%)	11 (9.4%)		
Reason for resection:			MC	0.392
Malignancy	33 (67.3%)	117 (58.2%)		
Benign	4 (8.2%)	25 (12.4%)		
Diverticula disease	4 (8.2%)	12 (6%)		
Obstruction	1 (2%)	13 (6.5%)		
Ischemia	3 (6.1%)	17 (8.5%)		
Coloproctitis	1 (2%)	13 (6.5%)		
Perforation	3 (6.1%)	4 (2%)		
Resection site:			MC	< 0.001*
Cecum	10 (20.4%)	56 (27.9%)		
Ascending colon	0 (0%)	38 (18.9%)		
Transverse colon	5 (10.2%)	11 (5.5%)		
Descending colon	20 (40.8%)	38 (18.9%)		
Sigmoid colon	8 (16.3%)	34 (16.9%)		
Rectum	6 (12.2%)	24 (11.9%)		
ASA:			60.998	< 0.001**
I, II	11 (22.4%)	161 (80.1%)		
III	38 (77.6%)	40 (19.9%)		
Primary operation:			MC	0.004*
Right hemicolectomy	10 (20.4%)	94 (46.8%)		
Left hemicolectomy	20 (40.8%)	38 (18.9%)		
Transverse colectomy	5 (10.2%)	11 (5.5%)		
Sigmoid colectomy	8 (16.3%)	34 (16.9%)		
Anterior resection	6 (12.2%)	24 (11.9%)		
Approach:			24.862	< 0.001**
Laparoscopic	19 (38.8%)	20 (10%)		
Open	30 (61.2%)	181 (90%)		
Reoperation:			124.165	< 0.001**
Absent	22 (44.9%)	201 (100%)		
Present	27 (55.1%)	0 (0%)		
Short term complications			Fisher	< 0.001**
Absent	33 (67.9%)	201 (100%)		
Present	16 (32.1%)	0 (0%)		
Postoperative complications			Fisher	< 0.001**
Absent	33 (67.9%)	201 (100%)		
Present	16 (32.1%)	0 (0%)		

Abbreviations: AJCC, American Joint Cancer Committee; ASA, American Society of Anesthesiologists; BMI, body mass index; HPE, Histopathological examination; MC, Mucinous carcinoma; SD, standard deviation.

Short-term Results after AL Reoperation

A stoma was performed during reoperation (79.5%), which was significantly different between different procedures: 65.5% in right hemicolectomy, 75.0% in transversectomy, 85.7% in left hemicolectomy, and 93.0% in sigmoid resection ($p < 0.001$).

Rates of mortality and admission to ICU after reoperation were 10.5 and 62.6%, respectively ($p < 0.001$). The highest

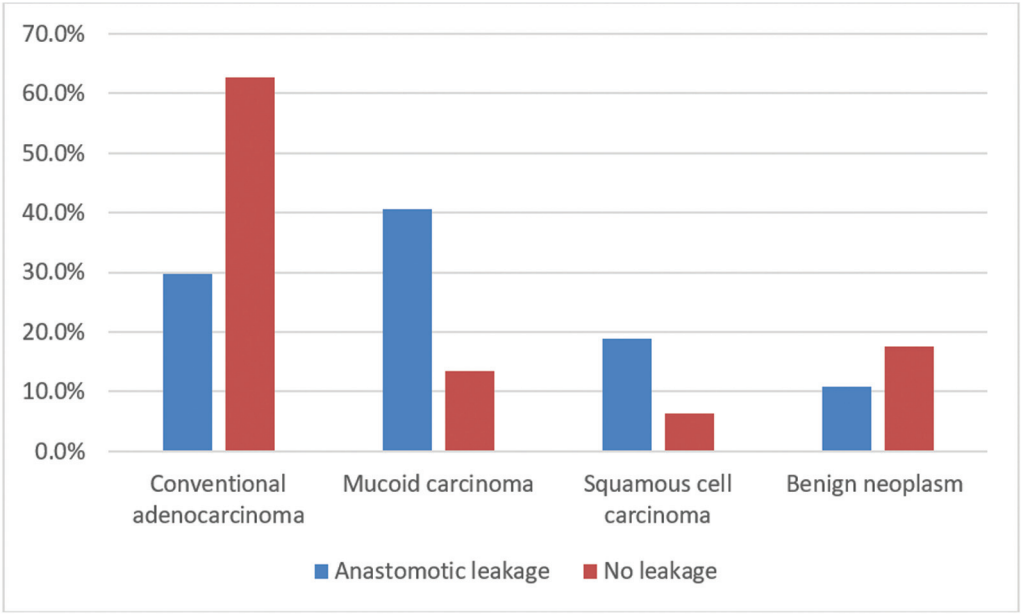

Fig. 2 Multiple bar chart showing the relation between site of resection and anastomotic leakage

Table 6 Multivariate regression analysis of factors associated with anastomotic leakage:

	β	*p-value*	AOR	95%CI	
				Lower	Upper
Adenocarcinoma		0.002*			
Mucoid carcinoma	2.845	0.001**	17.198	3.450	85.740
Squamous cell carcinoma	1.476	0.265	4.377	.327	58.552
Tumor complications (absent)	-2.659	0.001**	.070	.015	.327
Reoperation	-24.566	0.998	0	.000	.

Abbreviations: AOR, adjusted odds ratio; CI, confidence interval.
*$p < 0.05$ is statistically significant.
**$p \leq 0.001$ is highly significant statistically.

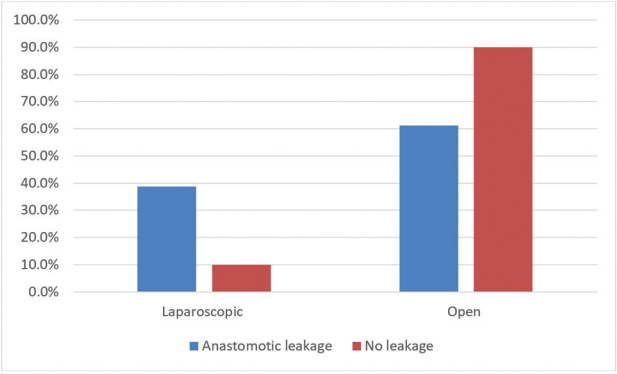

Fig. 3 Multiple bar chart showing the relation between approach and anastomotic leakage.

rates were found in patients who underwent a transversectomy or right hemicolectomy initially, followed by patients who underwent a left hemicolectomy or sigmoid resection. (►**Tables 5** and **6**, ►**Figure 3**).

There is a statistically significant relation between the incidence of leakage and the need for reoperation, short-term and postoperative complications. All patients who need reoperation developed short-term and postoperative complications had developed anastomotic leakage.

Duration of hospital stay of > 14 days in patients who underwent AL reoperation during the same admission occurred in 60% ($p = 0.004$). Anastomotic leakage reoperation during primary admission occurred in 13.7% was readmitted within 30 days, which was not different from the different colectomies ($p = 0.156$).

Regarding tumor factors and association with AL, factors significantly associated with incidence of leakage are mucoid and squamous cell carcinoma increase risk of leakage by 17.198 and 4.377 folds. Need for reoperation and absence of tumor complications protected against leakage. (►**Table 6**, ►**Figure 3**)

Discussion

In the present study, we assessed the incidence of occurrences of AL after colon resection for management of different colonic diseases.

We showed that the incidence differs according to site of resection.

Nearly similar results were obtained by Warps et al.,[9] who assessed postoperative outcomes of patients who underwent resection of the colon for the management of colon cancer and complicated with AL. They showed that rates of AL were generally 4.8%; 4.0% for right hemicolectomy to 15.4% for subtotal colectomy. Warps et al.[9] found similar results to us in that management of AL was mostly surgical reintervention (84.3%) but without statistically significant differences in rates of reoperation for the different colectomies.

Additionally, we showed that reoperations for the management of AL after colectomy were accompanied by ICU admission and prolonged hospital stay, which differs among the different surgical interventions. The worst complication rates were with transversectomy patients as higher rates of ICU admission. Patients who underwent right hemicolectomy and complicated with AL have lower rates of reoperation and creation of stoma than other types of colectomy.

Generally, rates of AL in different types of colectomy were less than rectal resection and the anastomosis after colonic resection might be easier, but infections can easily spread causing generalized peritonitis and sepsis thus associated with high mortality.[7,10]

We found nearly similar rates of AL after hemicolectomy to Gallo et al,[11] who found an AL rate of 7.4% after right hemicolectomy, while Warps et al.[9] found an AL rate of 4.0%.

In colon resection for the management of colon cancer, we found similar results to those of previous studies that there are non-significant differences in patient and tumor-related risk factors, incidence of multivisceral resection and metastasectomy.[1,11–14]

We showed similar results to Warps et al.,[9] that most reoperations for management of AL were performed on days 3 or 4. Our results are in line with results of previous reports that a time to reintervention for AL ranges from 4.0 to 12.7 days.[3,4,15,16]

In line with our findings, it was previously shown that AL which occurs early before day 6 is associated with more complications and higher mortality rates than late AL.[3,15]

Moreover, we suggested that AL rates related to the type of primary surgical procedure as consequences of anastomosis technical aspects such as type of stapling, location, and differences in vascularization. Similar to our findings, Sparreboom et al.,[3] demonstrated that surgical difficulties that happen during construction of the anastomosis were associated with early occurrence of AL, while poor conditions of patients and tissues were associated with occurrence of late leakage.

Anastomotic leakage after surgical resection of colon cancer is a major complication that leads to marked sepsis, but it was found that less than a third of cases with AL after colon cancer surgery could undergo successful anastomotic repair with no significant differences in 30-day and long-term mortality for anastomosis takedown and salvage.[17]

We found no significant differences in mortality rates for patients with or without defunctioning stoma during reoperation.

During reoperation, it must be kept in mind that the stoma itself leads to a significant complication rate[18,19] and reduction of quality of life,[19,20] so construction of stoma should not be routinely performed during AL reoperations after colectomy, particularly after right hemi-colectomy.

Points of Strength

Most previous studies assessed the rates of AL occurrence after colon cancer resection with no evaluation of rates of AL occurrence after colon resection for other non-neoplastic causes. However, in our study, we included all cases of AL after colon resection from all reasons. Additionally, we evaluated detailed short- and long-term complications after AL and reoperations at 90 days and after 90 days and detailed data about reintervention after colon resection and AL.

Limitations of the Present Work

We have not assessed overall survival rate and disease-free survival rate of patients, due to differences in selected groups with different pathological conditions.

Other lacking data in our work is related to the type and technique of constructed anastomosis and the severity of illness during reoperation due to limitations in registered data.

Conclusion

The present study evaluated the risks and rates of AL occurrence after colorectal resection for different neoplastic and inflammatory reasons.

Moreover, we evaluated rates and types of performed reintervention surgeries and the outcomes after reoperations.

We concluded that rates, types, time of occurrence, and severity of AL vary according to the type of colectomy performed. Our work detects the importance of diagnosis of AL, its management, and its outcomes after performing different types of colon resection to improve outcomes of surgical care. Additionally, selective construction of stoma during AL reoperation is currently safely applied with comparable mortality rates for patients who did and who did not have a stoma after reoperation.

Conflict of Interests

The authors have no conflict of interests to declare.

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