ORIGINAL ARTICLE

Early Detection and Management of Anastomotic Leakage after Colorectal Surgery

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Abstract

Background: ***The failure of colorectal anastomoses can result in severe immediate and long-term repercussions, such as extended hospital stays, additional interventions, and elevated morbidity and mortality.***

Aim of the work: ***To detect anastomotic leakage (AL) early after colorectal resection (CAL) and manage it with conservative or surgical intervention according to the case.***

Patients and methods ***This prospective study was carried out on 30 patients presented by AL after colorectal surgery who underwent surgery in the department of surgery of Al-Azhar university hospitals. All patients were divided into 2 groups: Group I (n=6): patients had AL (20%). Group II (n=24): patients without AL (80%).***

Results: ***Univariate logistic regression analysis was done to predict the occurrence of the anastomosis leakage. None of tested parameters could significantly predict occurrence of anastomosis leakage.***

Conclusions: ***Early detection of AL after CAL had an efficient role after CAL. Total leucocyte count (TLC) and C-reactive protein (CRP) will be insightful in detection of AL with high sensitivity in the first 5 days after leakage. Our study parameters cannot predict AL after CAL.***

Keywords: Early Detection; Management; Anastomotic Leakage; Colorectal Surgery

1. Introduction

The failure of colorectal anastomoses can result in severe long-term and acute consequences, such as increased morbidity and mortality, prolonged durations of stay, and the necessity for increased interventions.[1] Anastomotic leakage (AL) is a detested complication that is associated with a significant mortality rate (6%-22%) following colorectal resection (CAL). The rate of mortality is contingent upon the interpretation of anastomotic leak and individual risk factors. [2]

The identification of leaks at an early stage is essential to reduce the potential morbidities associated with this complication. Despite improvements in perioperative care, new devices for bowel reapproximation, a more comprehensive understanding of risk factors for anastomotic complications, and advancements in the fight against surgical infections, we continue to encounter challenges in the management and occurrence of this complication. [3]

Compared to patients without CAL, morbidity is significantly elevated, resulting in reoperations, radiological interventions, and persistent stomas in 56% of cases. After colorectal surgery, CAL is the most common cause of postoperative mortality and significantly increases the likelihood of a persistent stoma. [4]

The majority of papers on this subject report a worse oncologic outcome in terms of increased local recurrence and a negative association with survival, despite the fact that the available data on the influence of CAL on long-term oncologic outcomes is not wholly consistent. [5]

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The incidence of CAL has not decreased over the past three decades, despite the fact that numerous studies have been conducted to investigate the risk factors, surgical techniques, and prevention of CAL. A study on the incidence of CAL after restorative colon and rectum resections in 9,192 registered patients in the Netherlands over 2010 was recently published by the Dutch Surgical Colorectal Audit. The incidence was 8.7%. [6]

Furthermore, as patients are anticipated to age and develop a greater number of comorbidities, colorectal surgeons and patients alike will be increasingly exposed to CAL and the upcoming challenges associated with diagnosis and treatment. [7]

The incidence should be decreased, and the outcome must be enhanced. The design of pertinent future research will be facilitated by an understanding of current developments and their omissions.

The aim of this work was to early detect the AL after CAL and manage it conservatively or with surgical intervention according to the case.

2. Patients and methods

This prospective study was carried out on 30 patients who presented with AL after colorectal surgery and underwent surgery in the department of surgery of Al-Azhar University Hospitals. Informed written consent was obtained from the patients. The study was done after approval from the Ethics Committee of the Faculty of Medicine, Al-Azhar University.

Inclusion criteria were patients with AL after colorectal surgery.

Exclusion criteria were patients with synchronous abdominal pathology, patients who were medically unfit for surgery, and patients with Advanced abdominal tumors.

Grouping:

After completing all investigations, 30 patients were categorized into two groups: the first group including 6 (20%) patients had AL and the second group included 24 (80%) patients without AL.

AL was identified either through clinical assessment or via operative and radiological interventions. In cases where AL was clinically apparent, immediate re-laparotomy was performed without the need for radiological confirmation to prevent potential complications. Tachycardia (heart rate >100 beats/minute), fever (body temperature >38°C), prolonged adynamic ileus (>2 days postoperatively), leukocytosis (>10×10^3 /ml), and delayed gastric emptying (nasogastric tube production of <200 ml/day or vomiting necessitating reinsertion of the tube) were clinical parameters that were indicative of AL. Biomarkers (C-reactive protein (CRP), procalcitonin (PCT)) and clinical indications of AL were compared.

All patients underwent a comprehensive history-taking process that included demographic information (age, gender, medical and surgical history), presenting symptoms, surgical procedure, and risk factors. Examinations included a general examination of vital signs, level of consciousness, and general condition, as well as an abdominal examination and other systems. Laboratory investigations included a complete blood count (CBC), CRP, random blood sugar (RBG), arterial blood gases, liver function tests (AST and ALT), renal function tests (urea and creatinine), and coagulation profiles (prothrombin time (PT), activated partial thromboplastin time (PTT), and international normalized ratio (INR).

All patients underwent imaging, including (Pelviabdominal ultrasound, pelviabdominal CT with contrast or MRI, barium study according to the case). The maximal surgical effort, including conservative management and surgical intervention, was conducted.

The American Society of Anesthesiologists is a key professional organization in anesthesiology, dedicated to improving anesthesia practice and patient care. It developed the ASA Physical Status (PS) Classification System to assess and categorize patients' health before anesthesia, aiding anesthesiologists in evaluating risks and planning appropriate care. [8]

Patients undergoing surgery were instructed to fast from solid foods starting 6 hours before the operation. For right-sided colon surgery, no specific colon preparation was required. However, for left-sided colon surgery, patients underwent a preparation regimen starting 2 days prior, which included the use of laxatives, enemas, and antibiotics such as Neomycin and Flagyl tablets.

Upon entering the operating room, patients had an intravenous line, Ryle's tube, urinary catheter, and epidural catheter inserted. Prophylactic antibiotics were administered to all patients. Anesthesia was then initiated, and the abdomen was sterilized. The procedure involved midline exploration, dissection around the affected area, resection of the affected part, and end-to-end anastomosis. Blood loss was calculated, and any blood transfusions were recorded along with the operation's duration. After the procedure, patients recovered and were transferred to the ICU for postoperative care.

Use of staplers in laparoscopic and open anastomosis. Two main varieties of staplers are employed: circular and linear. Circular staplers are employed to create end-to-end anastomoses, while linear staplers are employed to create side-to-side anastomoses.. Open end-to-end and end-to-side anastomoses were performed using hand-sewn techniques.

On the day of operation, postoperative care

involved the removal of Ryle's tube and urinary catheter. All patients received effective analgesia for pain management. Vital signs and random blood sugar levels were closely monitored. Patients were encouraged to sip water once they passed flatus and to start moving as soon as possible to promote recovery. On the second day, patients were advised to increase their fluid intake, and by the third day, they were encouraged to begin consuming semi-solid foods to support their nutritional needs and facilitate recovery.

All patients underwent laboratory investigations including a CBC, bleeding profile (PT, PTT, INR), liver and kidney function tests, and electrolyte levels. C-reactive protein (CRP) and PCT levels were measured 8 hours after the incision, and subsequently on the third and fifth postoperative days (PODs). These markers were checked daily if elevated until they returned to normal levels, at which point the patient was discharged.

Follow-up with all patients was conducted at the outpatient clinic 30 days following the operation. Registering any complications and patient readmissions.

Statistical analysis:

SPSS version 28 (IBM, Armonk, New York, United States) was employed for data management and statistical analysis. The Kolmogorov–Smirnov test was employed to evaluate the normality of quantitative data. The mean and standard deviation of quantitative data were calculated, while categorical data were summarized as percentages and numbers. The unpaired t-test was employed to compare quantitative data between any two unpaired groups, while the Chi-square and Fisher's exact tests were employed to compare categorical data. Binary logistic regression was employed to identify predictors of anastomosis leakage. Anastomosis leakage was diagnosed by conducting an ROC analysis on TLC and CRP. We calculated the diagnostic indices, optimal cutoff points, and areas under the curve with 95% confidence intervals. In all cases, the statistical testing was two-sided. Significance was assigned to P values that were less than or equal to 0.05.

3. Results

Table 1. Demographics and history of chronic illness and baseline lab findings of the studied patients according to occurrence of cardiac events No significant difference between the two groups regarding AST, ALT, s. creatinine, Albumin or RBG

PARAMETERS		PRESENCE OF ANASTOMOSIS LEAKAGE		TOTAL PARTICIPANTS N=30	P-VALUE
		Yes n=6 (20.0%)	No n=24 (80.0%)		
AGE (YEARS)		62.5±7.8	65.4±7.2	64.8±7.3	0.395
GENDER	Males	13 (54.2%)	2 (33.3%)	15 (50.0%)	0.651
	Females	11 (45.8%)	4 (66.7%)	15 (50.0%)	
BMI (KG/M2)		24.3±1.5	27.0±4.1	26.5±3.9	0.014*
HISTORY OF CHRONIC ILLNESS	HTN (mmHg)	5 (20.8)	2 (33.3)	7 (23.3)	0.603
	DM	3 (12.5)	1 (16.7)	4 (13.3)	1.0
BASELINE LAB FINDINGS	AST (U/L)	62.0±16.5	58.5±17.1	59.2±16.8	0.652
	ALT (U/L)	56.0±10.3	50.8±17.9	51.9±16.7	0.507
	S. creatinine (mg/dL)	0.8±0.3	0.9±0.4	0.9±0.4	0.522
	Albumin (g/dl)	2.4±0.9	2.7±1.1	2.7±1.1	0.568
	RBG (mg/dL)	125.7±20.5	143.1±29.5	139.6±28.5	0.186

Data are presented as mean ± SD or frequency (%)., DM: Diabetes Mellitus, HTN=Hypertension,ALT: Alanine transaminase, AST: Aspartate Aminotransferaset, RBG: Random Blood Glucose, S. creatinine: Serum creatinine BMI: body mass index, *Indicates significant p-value at 0.05 .

No significant difference between both groups as regard age. The males represented the highest proportion in patients presented with anastomosis leakage while females had higher proportion among patients without anastomosis leakage and the relation was non-significant. BMI was significantly higher among patients without anastomosis leakage (p=0.014). No significant difference between both groups' history of chronic illness. Table 1

Table 2. ASA PS, cTNM staging, type of surgery and resection range stratified by presence of anastomosis leakage

VARIABLES		PRESENCE OF ANASTOMOSIS LEAKAGE		TOTAL PARTICIPANTS N=30	P-VALUE
		Yes n=6 (20.0%)	No n=24 (80.0%)		
ASA PS	ASA PS 1	1 (16.7%)	13 (54.2%)	14 (46.7%)	<0.001*ŀ
	ASA PS 2	0 (0.0%)	10 (41.7%)	10 (33.3%)	
	ASA PS 3	1 (16.7%)	1 (4.2%)	2 (6.7%)	
	ASA PS 4	1 (16.7%)	0 (0.0%)	1 (3.3%)	
	ASA PS 5	2 (33.3%)	0 (0.0%)	2 (6.7%)	
	ASA PS 6	1 (16.7%)	0 (0.0%)	1 (3.3%)	
CTNM STAGING	Stage I	0 (0.0%)	7 (29.2%)	7 (23.3%)	0.106ŀ
	Stage II	2 (33.3%)	12 (50.0%)	14 (46.7%)	
	Stage III	3 (50.0%)	4 (16.7%)	7 (23.3%)	
	Stage IV	1 (16.7%)	1 (4.2%)	2 (6.7%)	
TYPE OF SURGERY	Open	1 (16.7%)	9 (37.5%)	10 (33.3%)	0.633ŀ
	Laparoscopic	5 (83.3%)	15 (62.5%)	20 (66.7%)	
RESECTION RANGE	Left and sigmoid resection	2 (33.3%)	10 (41.7%)	12 (40.0%)	0.277ŀ
	Low anterior resection	1 (16.7%)	10 (41.7%)	11 (36.7%)	
	Right and transverse resection	3 (50.0%)	4 (16.7%)	7 (23.3%)	

Data are presented as mean ± SD or frequency (%). ASA PS = Physical statuses (PS) of patients were defined according to classification of the American society of anesthesiology (ASA), cTNM: Clinical Tumour, Node, Metastasis ŀ Fisher exact test, *Significant p value

There was statistically significant difference between both groyps regarding ASA PS (p<0.001). 54.2% of patients without anastomosis leakage were ASA PS 1, while 33.3% of patients with anastomosis leakage were ASA PS 5. No statistically significant difference between patients who had anastomosis leakage and who didn't have any leakage as regard clinical tumour, node, metastasis (cTNM) staging (p=0.016). 10 (33.3%) of participants underwent open surgery, compared with 20 (66.7%) who underwent laparoscopic surgery. 40.0% of total participants had left and sigmoid resection, while only 23.3% of them had right and transverse resection. Table 2

Table 3. Changes in TLC, changes in CRP during follow-up period stratified by presence of anastomosis leakage

VARIABLES		PRESENCE OF ANASTOMOSIS LEAKAGE		P-VALUE
		Yes n=6 (20.0%)	No n=24 (80.0%)	
TLC	8h post-operative	14.5±2.4	9.1±2.0	<0.001* ŀ
	2nd day	16.6±2.6	11.5±1.6	<0.001* ŀ
	3rd day	20.1±3.8	12.6±1.6	<0.001* ŀ
	5th day	21.1±3.8	12.7±1.6	<0.001* ŀ
CRP	8h post-operative	84.7±17.2	65.4±20.5	0.044* ŀ
	2nd day	93.4±44.7	57.5±25.3	0.013* ŀ
	3rd day	94.6±7.6	55.3±23.4	<0.001* ŀ
	5th day	95.5±13.7	35.4±6.3	<0.001* ŀ

Data are presented as mean ± SD or frequency (%). TLC: total leukocyte count, CRP: C-reactive protein *Indicates significant p-value, ŀ unpaired t-test

TLC was significantly higher among patients with anastomosis leakage either at 8 h post-operative, 2nd day, 3rd day or 5th day post-operative (p<0.001). CRP was significantly higher among patients with anastomosis leakage either at 8 h post-operative, 2nd day, 3rd day or 5th day post-operative (p<0.001). Table 3

Table 4. ROC analysis of TLC, CRP to diagnose occurrence of anastomosis leakage

		AUC	95% CI	BEST-CUT OFF POINT	SENSITIVITY	SPECIFICITY	P-VALUE
TLC	8 hours post-operative	0.969	0.913-1.0	≥12.1	83.3%	95.8%	<0.001*
	2nd day	0.958	0.883-1.0	≥14.1	83.3%	91.7%	0.001*
	3rd day	0.965	0.893-1.0	≥16.3	83.3%	100.0%	<0.001*
	5th day	0.993	0.971-1.0	≥15.8	83.3%	100.0%	<0.001*
CRP	8 hours post-operative	0.764	0.587-0.941	≥72.0	66.7%	70.8%	0.049*
	2nd day	0.799	0.530-1.0	≥74.9	83.3%	79.2%	0.026*
	3rd day	0.917	0.806-1.0	≥82.6	100.0%	91.7%	0.002*
	5th day	1.0	1.0-1.0	≥62.0	100.0%	100.0%	<0.001*

Data are presented as mean ± SD or frequency (%).AUC: Area under the curve, CI=Confidence interval, CRP:C-reactive protein, TLC: total leukocyte count. *Significant P-value;

ROC analysis was done for TLC to diagnose occurrence of anastomosis leakage. It revealed a significant area under the curve of 0.969, 0.958, 0.965, and 0.993 on 8 hours post-operative, 2nd day, 3rd day, and 5th day respectively, indicating an excellent discrimination ability. The best cutoff point was ≥12.1, 8 hours post-operative at which sensitivity, and specificity were 83.3%, 95.8% respectively. The best cutoff point was ≥14.1, 2nd day post-operative at which sensitivity, and specificity were 83.3%, 91.7% respectively. The best cutoff point was ≥16.3, 3rd day post-operative at which sensitivity, and specificity were 83.3%, 100.0% respectively. The best cutoff point was ≥15.8, 5th day post-operative at which sensitivity, and specificity were 83.3%, 100.0% respectively. ROC analysis was done for CRP to diagnose occurrence of anastomosis leakage. It revealed a significant area under the curve of 0.764, 0.799, 0.917, and 1.0 on 8 hours post-operative, 2nd day, 3rd day, and 5th day respectively. The best cutoff point was ≥72.0, 8 hours post-operative at which sensitivity, and specificity were 66.7%, 70.8% respectively. The best cutoff point was ≥74.9, 2nd day post-operative at which sensitivity, and specificity were 83.3%, 79.2% respectively. The best cutoff point was ≥82.6 3rd day post-operative at which sensitivity, and specificity were

100.0%, 91.7% respectively. The best cutoff point was ≥62.0, 5th day post-operative at which sensitivity, and specificity were 100.0%, 100.0% respectively Table 4

Table 5. Predictors of occurrence of anastomosis leakage

VARIABLES	OCCURRENCE OF ANASTOMOSIS LEAKAGE			
	Univariate analysis			
	Crude OR	95% CI		p-value
		Lower bound	Higher bound	
AGE	0.949	0.843	1.069	0.389
MALE GENDER (RF=FEMALE)	0.423	0.065	2.766	0.369
BMI	0.746	0.506	1.10	0.139
DM (RF=NO)	1.4	0.119	16.459	0.789
HTN (RF=NO)	1.9	0.267	13.523	0.522
LAPAROSCOPIC OPERATIVE APPROACH (RF=OPEN)	3.0	0.301	29.940	0.349

Data are presented as mean ± SD or frequency (%). RF=Reference category, OR=Odds ratio, CI=Confidence interval, BMI: Body Mass Index, DM: Diabetes Miellitus, HTN:Hypertension, *Significant p value,

Univariate logistic regression analysis was done to predict the occurrence of the anastomosis leakage. None of tested parameters could significantly predict occurrence of anastomosis leakage. Table 5

Table 6. Distribution of participants according to maximal surgical effort needed for management of anastomosis leakage

MAXIMAL SURGICAL EFFORT	PATIENTS WITH ANASTOMOSIS LEAKAGE (NO=6)
CONSERVATIVE MANAGEMENT	2 (33.3%%)
•SURGICAL INTERVENTION	4 (66.7)

Data are presented as frequency (%).

For 2 out of 4 patients who developed anastomosis leakage required conservative management (33.3%), however 66.7% of them required surgical intervention. Table 6

4. Discussion

AL is a significant complication after colorectal surgery that increases postoperative morbidity and mortality. Between 0.8% and 27% of mortality-related fistulas were reported, while the incidence rate of anastomotic leaks following colorectal surgery ranged from 2% to 19%. The frequency of disease-free survival, overall survival, and local recurrence is significantly diminished by AL. [9]

We compared 30 patients; 6 had AL (20%) and 24 had no AL (80%).

However, a prospectively collected, extensive clinical database was used to ascertain the pre- and intraoperative factors that influence AL in colorectal surgery. It was observed that the AL rate was 3.9%.[10]

We found that the mean age of the studied patients was 64.8±7.3 years. The males represented the highest proportion in patients presented with anastomosis leakage (54.2%), while females had higher proportion among patients without anastomosis leakage (66.7%). No significant difference between both groups as regard age and gender.

There is a possibility that the aforementioned findings are attributable to the fact that anastomosis in the constricted male pelvic leads to a more difficult resection for men in both open and laparoscopic colorectal surgery. In addition, the healing of anastomoses may be influenced by variations in the intestinal microcirculation that are related to androgens .[11]

These results were supported by a recent study, which found male gender ($p < 0.001$) to be an independent variable associated with increased AL rate, but they found a significant difference may be due to their high sample size (n=52) compared to ours. [12]

However, a mean age of 48.9± 14.2 years was shown, males outnumbered females and accounted for 60% of the included patients. [13]

BMI was significantly higher among patients without anastomosis leakage (p=0.014).

It was shown that the mean BMI was 26 ± 4.9 kg/m2 in patients with no significant demographic difference found between the two groups with and without AL. [14]

Our results showed no significant difference between both groups history of chronic illness including hypertension (HTN) and diabetes mellitus (DM), as well as baseline lab findings including AST, ALT, serum creatinine (s. creatinine), Albumin and RBG.

On the contrary, a significant difference was found in preoperative blood tests between patients with and without leak, including Serum creatinine, Serum albumin, WBCs, and Hematocrit. [10]

There was a statistically significant difference between the two groups regarding ASA physical statuses (PS) ($p<0.001$). 54.2% of patients without anastomosis leakage were ASA PS 1, while 33.3% of patients with anastomosis leakage were ASA PS 5.

Similarly, it was stated that 31% of patients with leakage had ASA 3 or 4. [15]

However, no significant demographic difference was found between the two groups with and without AL regarding ASA results. [14]

In our study, 10 (33.3%) of participants underwent open surgery, compared with 20 (66.7%) who underwent laparoscopic surgery. 40.0% of total participants had a left sigmoid resection, while only 23.3% of them had a right transverse resection.

During the follow-up period, TLC was significantly higher among patients with anastomosis leakage either at eight hours post-operative, second day, third day, or fifth day post-

operative (p<0.001).

CRP was significantly higher among patients with anastomosis leakage either at eight hours post-operative, second day, third day, or fifth day post-operative (p<0.001).

Both CRP and TLC results were confirmed by a study which found that comparison of TLC and CRP levels between patients who developed AL and those who did not showed that baseline TLC and CRP showed no statistically significant difference between groups, while Day 1, Day 2, Day 3, and Day 4 showed significantly higher levels among the leakage group with p values<0.001. [13]

However, it was found that serum CRP levels did not exhibit any statistically significant variations in the initial three postoperative days. However, serum CRP levels in patients with AL significantly increased in comparison to those without leakage after POD 4, as compared to those without. Patients who experienced leakage experienced an increase in serum CRP levels from POD 2, while those who did not experience leakage experienced a decrease. [16]

ROC analysis was conducted for TLC to diagnose the occurrence of anastomosis leakage. It revealed a significant area under the curve of 0.969, 0.958, 0.965, and 0.993 on 8 hours post-operative, second day, third day, and fifth day respectively, indicating an excellent discrimination ability. The best cutoffcutoff point was ≥12.1, 8 hours post-operative at which sensitivity, and specificity were 83.3%, 95.8% respectively.

The best cutoff point was ≥14.1, 2nd day post-operative, at which sensitivity and specificity were 83.3%, 91.7% respectively. The best cutoff point was ≥16.3, 3rd day post-operative, at which sensitivity and specificity were 83.3%, 100.0% respectively. The best cutoffcutoff point was ≥15.8, 5th day post-operative, at which sensitivity and specificity were 83.3%, 100.0% respectively.

While a recent study showed that TLC levels on Day 1, 2, 3, 4, and 5 can significantly predict AL using cutoffs 12, 11.5, 12.1, 12, and 12.7, respectively, with sensitivity 59.1% to 81.8% and specificity 64.4-95%. [13]

ROC analysis was done for CRP to diagnose the occurrence of anastomosis leakage. It revealed a significant area under the curve of 0.764, 0.799, 0.917, and 1.0 on 8 hours post-operative, second day, third day, and fifth day, respectively. The best cutoff point was ≥72.0, 8 hours post-operative, at which sensitivity and specificity were 66.7%, 70.8% respectively. The best cutoff point was ≥74.9, 2nd day post-operative, at which sensitivity and specificity were 83.3%, 79.2% respectively. The best cutoff point was ≥82.6 on the third day post-operative, at which sensitivity and specificity were 100.0%, 91.7% respectively. The best cutoff point was ≥62.0, 5th day post-operative, at which sensitivity and specificity were 100.0%, 100.0% respectively.

Similar to our findings, the area under the curve was 0.821, and the negative predictive value was 97.2%. The CRP levels were most accurate on postoperative day 4, with a threshold level of 180 mg/L. [16]

While a recent study showed that CRP levels on Day 1, 2, 3, 4, and 5 can significantly predict AL using cutoffs of 70, 100, 118, 151, and 160, respectively, with a sensitivity of 86.5% to 91% and a specificity of 42- 98% . [13]

In contrast, ROC analysis determined that a cutoff CRP of 148 mg/l was required on POD3, with a sensitivity and specificity of 95%. The cutoff levels for POD4 through POD7 were 123 mg/l, 115 mg/l, 105 mg/l, and 96 mg/l, respectively, with a sensitivity and specificity of 100%.[17]

Univariate logistic regression analysis was done to predict the occurrence of the anastomosis leakage. None of tested parameters could significantly predict occurrence of anastomosis leakage.

On the other hand, it was noted that younger patients, male gender, ASA score, smoking, diabetes, a preoperative serum albumin level of < 4 g/dl, elective rectal cancer surgery, emergency colectomy for bleeding, and splenic flexure mobilization were associated with an increased risk of AL. [10]

In contrast, in A multivariate analysis, the following variables were independently associated with AL: male sex (P< 0.01), anastomosis at a distance of 6.5 cm or less from the anal periphery (P 0.01), and age of 62.5 years or less (P 0.03). [12]

In our study, for 2 out of 4 patients who developed anastomosis leakage required conservative management (33.3%), however 66.7% of them required surgical intervention.

It was found that all patients with AL underwent re-operation. [15]

The limitations of the study had a relatively small sample size compared to previous studies, which may have contributed to insignificant results. Lack of some variables and multivariate analysis.

4. Conclusion

Early detection of AL after CAL had an efficient role after CAL. TLC and CRP will be insightful in detection of AL with high sensitivity in the first 5 days after leakage. Our study parameters cannot predict AL after CAL.

Therefore, we recommend following up with the patients for early detection of AL after CAL. We recommend conducting the same study with the same aim and methodology on a larger

sample size and a longer follow-up period to get more significant results. We recommend conducting a multivariate analysis and measuring more variables and scores, as in previous literature.

Disclosure

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References

1. Kim IY, Kim BR, Kim YW. Applying reinforcing sutures to stapled colorectal anastomosis after low anterior resection for rectal cancer. Eur J Surg Oncol. 2015;41:808-50.
2. Habib K, Gupta A, White D, Mazari FA, Wilson TR. Utility of contrast enema to assess anastomotic integrity and the natural history of radiological leaks after low rectal surgery: systematic review and meta-analysis. Int J Colorectal Dis. 2015;30:100-40.
3. Boccola MA, Buettner PG, Rozen WM, Siu SK, Stevenson AR, Stitz R, Ho YH. Risk factors and outcomes for anastomotic leakage in colorectal surgery: a single-institution analysis of 1576 patients. World J Surg. 2011;35:186-95.
4. Arezzo A, Verra M, Passera R, Bullano A, Rapetti L, Morino M. Long-term efficacy of endoscopic vacuum therapy for the treatment of colorectal anastomotic leaks. Dig Liver Dis. 2015;47:342-50.
5. Lamazza A, Sterpetti AV, De Cesare A, Schillaci A, Antoniozzi A, Fiori E. Endoscopic placement of self-expanding stents in patients with symptomatic anastomotic leakage after colorectal resection for cancer: long-term results. Endoscopy. 2015;47:270-90.
6. Ikeda T, Kumashiro R, Oki E, Taketani K, Ando K, Aishima S, et al. Evaluation of techniques to prevent colorectal anastomotic leakage. J Surg Res. 2015;194:450-7.
7. Lin X, Li J, Chen W, Wei F, Ying M, Wei W, Xie X. Diabetes and risk of anastomotic leakage after gastrointestinal surgery. J Surg Res. 2015;196:294-301.
8. Daabiss M. American Society of Anaesthesiologists physical status classification. Indian J Anaesth. 2011;55:111-50.
9. Arron MNN, Greijdanus NG, Ten Broek RPG, Dekker JWT, van Workum F, van Goor H, et al. Trends in risk factors of anastomotic leakage after colorectal cancer surgery (2011-2019): A Dutch population-based study. Colorectal Dis. 2021;23:3251-61.
10. Parthasarathy M, Greensmith M, Bowers D, Groot-Wassink T. Risk factors for anastomotic leakage after colorectal resection: a retrospective analysis of 17 518 patients. Colorectal Dis. 2017;19:288-98.
11. Zarnescu EC, Zarnescu NO, Costea R. Updates of Risk Factors for Anastomotic Leakage after Colorectal Surgery. Diagnostics (Basel). 2021;11:55-60.
12. Alekseev M, Rybakov E, Khomyakov E, Zarodnyuk I, Shelygin Y. Intraoperative fluorescence angiography as an independent factor of anastomotic leakage and a nomogram for predicting leak for colorectal anastomoses. Ann Coloproctol. 2022;38:380-40.
13. Mohammed OR, Shafik AA, Mohammed MT, El-Sherif MS. Serum C reactive Protein versus Total Leucocytic Count in Early Diagnosis of Leakage in Colonic Anastomosis. Ain Shams J Surg. 2024;17:89-97.
14. Martin G, Dupré A, Mulliez A, Prunel F, Slim K, Pezet D. Validation of a score for the early diagnosis of anastomotic leakage following elective colorectal surgery. J Visc Surg. 2015;152:5-10.
15. Rickert A, Willeke F, Kienle P, Post S. Management and outcome of anastomotic leakage after colonic surgery. Colorectal Dis. 2010;12:216-23.
16. Messias BA, Botelho RV, Saad SS, Mocchetti ER, Turke KC, Waisberg J. Serum C-reactive protein is a useful marker to exclude anastomotic leakage after colorectal surgery. Sci Rep. 2020;10:168-79.
17. Yeung DE, Peterknecht E, Hajibandeh S, Hajibandeh S, Torrance AW. C-reactive protein can predict anastomotic leak in colorectal surgery: a systematic review and meta-analysis. Int J Colorectal Dis. 2021;36:1147-62.