

Anterior, Low, and Ultra Low Resection of Rectal Cancer with or without Diverting Ileostomy: Short-Term Outcome

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ABSTRACT

Background:

The literature shows that diverting ileostomy reduces the rate of anastomotic leak. However, many others recommend the reverse, making the issue debatable. Hence, this study was designed to overcome this debate and, consequently, to adopt an evidence-based option.

Objectives: This study aimed to evaluate the protective effect of diverting ileostomy in rectal surgery for rectal cancer, namely anterior, low, and ultra-low anterior resection.

Materials and Methods:

This is a prospective study that included 55 patients with rectal cancer in the upper, middle, and lower thirds, as confirmed by histopathology. All of them had undergone anterior, low, and ultra-low anterior resection, respectively, with or without diverting ileostomy.

Results:

This study included 23 patients with anterior resection, and 32 patients with low and ultra-low anterior resection (14 and 18, respectively). It shows that anastomotic leak occurred in eight patients (14.54%) of the 55 patients included in this study. There were seven patients (21.21%) out of 33 without diverting ileostomy who developed anastomotic leak, while there was only one patient (4.54%) out of 22 with diverting ileostomy who developed anastomotic leak. There were five patients (15.62%) out of 32 who had undergone low and ultra-low anterior resection who developed a leak; in comparison, three patients (13.04%) out of 23 who had undergone anterior resection developed a leak. There were two patients out of eight patients with leak, received neoadjuvant chemoradiotherapy, whereas the remaining six patients did not receive. In five patients out of eight patients with a leak, the anastomosis was done by hand sewn, whereas in the remaining three, the anastomosis was performed by stapler. There were three men with a leak out of eight, whereas there were five women with a leak.

Conclusion:

Diverting ileostomy might decrease the chance of anastomotic leak in rectal surgery for rectal cancer and make a better response to conservative management if it occurs and reduce its serious sequelae.

Keywords: Anastomotic leak; Diverting loop ileostomy; Elective low anterior resection; Rectal cancer; Short-term postoperative outcome; Tumor location

please cite this paper as:

Jasim NH, Shaker Abdulkarim K, Abdulkareem Abdullah M, Dawood Al-Hilfi A. Anterior, Low, and Ultra Low Resection of Rectal Cancer With or Without Diverting Ileostomy: Short-Term Outcome. *Govaresh*.2026;30:223-229.

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Received: 28 Jul. 2025

Revised: 19 Nov. 2025

Accepted: 20 Nov. 2025

INTRODUCTION

It is known that rectal resection with restoration of gastrointestinal tract continuity by colorectal or coloanal anastomosis is the gold-standard procedure for treatment of upper-third, middle-third, and lower-third rectal cancer by anterior, low anterior, or ultralow anterior resection, respectively (1). Post-operative anastomosis leak and its consequences are considered a serious early complication after these surgeries, particularly low and ultralow anterior resection for rectal cancer (2). The incidence of anastomotic leak after low anterior resection is stated to be 3-23% (2). Hence, proximal diverting loop ileostomy has been adopted and performed by some centers of colorectal surgery to reduce the incidence of leak through the anastomotic line, particularly after low or ultra-low anterior resection (3-4). Conversely, variable types of rectal resection without ileostomy have been reported by other surgeons, showing that the presence of a diverting ileostomy does not reduce the incidence of postoperative anastomotic leak (5,6). Many studies support rectal surgery without diverting to an ileostomy to avoid complications of ileostomy and its complications, such as the necessity to reverse and thus long hospital stay and accompanying morbidity (7-9). Some surgeons report the inability of ileostomy reversal throughout the whole life of patients (10). However, much literature has inconsistently revealed varying outcomes concerning the role of ileostomy in rectal surgeries, particularly in the protection of the line of anastomosis and reducing the rate of leak, besides mortality and morbidity (11,12). Moreover, in our region (southern Iraq), there is no evidence-based published report comparing the rate of anastomotic leak after different types of proctectomy with and without concurrent ileostomy for different levels of rectal cancer, and the issue is still debatable. Hence, there is a necessity for wise evaluation of the impact of doing a simultaneous ileostomy on the early outcome postoperatively after rectal surgeries, particularly anastomotic leak.

Objectives

The current study aimed to assess the effect of concurrent diverting ileostomy to decrease the incidence of leak in different types of rectal surgeries for different levels of rectal cancer.

MATERIALS AND METHODS

The current study was a prospective cross-sectional study involving 55 patients admitted to surgical wards at Basrah Gastroenterology and Hepatology Hospital from January 2022 to September 2025. The study was approved by the Ethical Approval Committee of Basrah College of

Medicine, Basrah, Iraq. Written informed consent was obtained from participants. Additionally, the study was conducted in accordance with the updated version (October 2024) of the Helsinki principles.

All patients underwent elective anterior, low anterior, and ultra-low anterior resection for upper, middle, and lower third rectal cancer, respectively. Patients presented as emergency cases, such as intestinal obstruction, or patients who had undergone proctectomy for an etiology other than rectal cancer, were excluded from this study. The diagnosis was confirmed in all patients as a rectal cancer by colonoscopy and histopathological exams of biopsies. Computed tomography (CT) staging and pelvic magnetic resonance imaging (MRI) were done for all of them. Neoadjuvant chemoradiotherapy was given by an oncologist once indicated.

All patients were assessed for the risk of general anesthesia. Detailed explanations of surgical procedures and their possible complications were provided to all patients, including the stoma complications. The choice of performing a diverting ileostomy or not depended on the surgeon's preference and the patient's acceptance. Surgical operations were done by different surgeons of the same level.

Mechanical and chemical bowel preparation was done for all patients one day before surgery, including polyethylene glycol, saline enema, and metronidazole. Packed RBC and whole blood pints were prepared accordingly. Ceftriaxone vial 1 gm was given 1 hour before starting the surgical operation. Compression stockings were used to reduce the possibility of deep venous thrombosis during surgery.

Surgical operations were done using Lloyd Davies' position, a midline incision was used, and an inspection of the whole abdomen was performed, particularly examining any hepatic metastasis or peritoneal seedings. Mobilization of the sigmoid colon and rectum followed by total mesorectal excision and division of the rectum with proximal and distal safe margins, and the anastomosis was done either by hand-sewn or circular stapler, performing side-to-end colorectal or coloanal anastomosis with or without diverting ileostomy. In the surgical ward, patients received intravenous fluid and metronidazole 500 mg vial three times daily, intravenously, broad-spectrum antibiotics such as ceftriaxone 1 gm two times daily, intravenously, subcutaneous enoxaparin 4000 IU once daily, and analgesia with close monitoring. For patients with a diverting ileostomy, stoma care training was given to all patients and their relatives. The patients were mobilized earlier on the operative night. Oral clear fluid intake was started 24 hours after surgery in patients with a diverting ileostomy and after passing flatus in the non-ileostomy group. Five days postoperatively, Folly's

catheter was removed. The pelvic drain was removed when it was usually non-functioning or showed no significant drainage, and the stoma started functioning. During this period in the surgical ward, checking patients to detect any possible complications, such as leak of anastomotic line or recording any temperature elevation, severe abdominal or anal pain, or any discharge through the wound or anus, was done. In patients with ileostomy, reversal of the ileostomy was achieved two months postoperatively after adequate patient assessment. Follow-up was scheduled as follows: after 2 weeks for stitches removal and patients' checkup to detect any possible complications like a leak. Then, every 3 months for 1 year.

Statistical analysis was conducted using SPSS software version 26. Qualitative data were expressed in terms of number and percentage, while quantitative data were expressed in terms of mean±SD. The Pearson Chi-square test was used to assess statistical associations, and a P value < 0.05 was considered statistically significant.

RESULTS

The current study included 55 patients. There were 25 men and 30 women with a male/female ratio equal to 1:1.2. Their ages ranged from 21 years to 82 years, with a mean age of 53.95±15.88 years.

All patients were diagnosed with rectal cancer, whether upper third, middle third, or lower third rectal carcinoma. Therefore, they underwent anterior resection in 23 patients (41.82%), low anterior resection in 14 patients (25.45%), and ultralow resection in 18 patients (32.73%) as shown in Table 1.

Regarding patients who underwent anterior resection (23 patients), there were four patients (17.4%) out of 23 exposed to a diverting ileostomy as part of the procedure. In addition, there were four patients (17.4%) out of 23 who received neoadjuvant chemo-radiotherapy (C/R). In this group, surgery was performed by stapler anastomosis in 13 patients (56.53%) and by hand sewing in 10 patients (43.47%). Anastomotic leak occurred in three patients (13.04%) out of 23 patients, as illustrated in Table 1.

Regarding patients who underwent low anterior resection (14 patients), there were eight patients (57.15%) out of 14 exposed to diverting ileostomy as part of the procedure. In addition, there were 10 patients (71.43%) out of 14 who received neoadjuvant chemo-radiotherapy (C/R). In this group, surgery was performed by stapler anastomosis in 11 patients (78.57%) and by hand sewing in three patients (21.43%). Anastomotic leak occurred in two patients (14.28%) out of 14 patients as shown in Table 1.

Regarding patients who underwent ultra-low anterior resection (18 patients), there were 10 patients (55.55%) out of 18 exposed to diverting ileostomy as part of the procedure. In addition, there were 13 patients (72.23%) out of 18 who received neoadjuvant chemo-radiotherapy (C/R). In this group, surgery was performed by stapler anastomosis in 12 patients (66.66%) and by hand sewn in six patients (33.34%). Anastomotic leak occurred in three patients (16.66%) out of 18 patients, as illustrated in Table 1.

Based on the above data, the surgery was accompanied by a diverting ileostomy as part of the operation in 22 patients (40%), whereas the operations were performed without a diverting ileostomy in 33 patients (60%), as shown in Table 1.

The anastomotic leak was detected in eight patients (14.54%) out of 55 total patients.

Table 1 shows that there was a significant statistical association between the type of surgery (level of resection) and ileostomy performance (P=0.0148), meaning that lower resection levels were associated with a higher probability of diverting ileostomy formation. Furthermore, there was a highly significant association between the type of surgery (level of resection) and preoperative receipt of neoadjuvant chemoradiotherapy (P=0.00035), reflecting that whenever the level of resection was descending toward the anal verge, patients were more likely to receive neoadjuvant chemoradiotherapy. However, the anastomosis technique and the presence of a leak were found non-significantly associated with the type of surgery (level of resection) (P=0.3889 and 0.9476, respectively).

Table 1. Associations of ileostomy performance, chemoradiotherapy (C/R), anastomosis technique, and presence of leak with the level of resection

Type of surgery (Level of resection)	Patients No.	Ileostomy performance		C/R		Anastomosis technique		Presence of a leak	
		Yes	No	Yes	No	Stapler	Hand sewn	Yes	No
Anterior resection	23 (41.82%)	4 (17.40%)	19 (82.60%)	4 (17.40%)	19 (82.60%)	13 (56.53%)	10 (43.47%)	3 (13.04%)	20 (86.96%)

Table 1. Associations of ileostomy performance, chemoradiotherapy (C/R), anastomosis technique, and presence of leak with the level of resection

Type of surgery (Level of resection)	Patients No.	Ileostomy performance		C/R		Anastomosis technique		Presence of a leak	
		Yes	No	Yes	No	Stapler	Hand sewn	Yes	No
Low anterior resection	14 (25.45%)	8 (57.15%)	6 (42.85%)	10 (71.43%)	4 (28.57%)	11 (78.57%)	3 (21.43%)	2 (14.28%)	12 (85.72%)
Ultra-low anterior resection	18 (32.73%)	10 (55.55%)	8 (44.45%)	13 (72.23%)	5 (27.77%)	12 (66.66%)	6 (33.34%)	3 (16.66%)	15 (83.34%)
Total	55	22 (40%)	33 (60%)	27 (49.10%)	28 (50.90%)	36 (65.46%)	19 (34.54%)	8 (14.54%)	47 (85.46%)
P value*		0.0148		0.00035		0.3889		0.9476	

Regarding eight patients with anastomotic leak (14.54%) of 55 total patients involved in this study, they were distributed between two groups with and without ileostomy.

There were seven patients (21.21%) out of 33 in whom the surgical operations were performed without diverting ileostomy who developed anastomotic leak, while there was only one patient (4.54%) out of 22 patients in whom the operation was accompanied by diverting ileostomy, as shown in Table 2.

The one patient with a diverting ileostomy as part of an ultralow anterior resection developed a minute leak postoperatively with a small-sized pelvic collection diagnosed by contrast CT scan. This patient responded very well to conservative treatment, and the anastomotic leak closed spontaneously, which was proved by a barium enema study before ileostomy reversal.

Regarding the seven patients (without diverting ileostomy) who developed leaks, five of them had low-output leaks and successfully responded to conservative treatment, whereas one patient with an ultra-low anterior resection was successfully treated by surgical intervention, including the creation of a diverting ileostomy and drainage of the collection with antibiotics. Lastly, the other patient with a leak after low anterior resection was a female patient

complicated with local recurrence of tumor, necessitating an abdominoperineal resection with permanent colostomy eventually. There was no death among patients of the current study during the scheduled follow-up period.

In regard to a single anastomotic leak in the ileostomy group, the patient received neoadjuvant chemoradiotherapy preoperatively, and an anastomosis was done by stapler. The operation was an ultralow anterior resection. The patient was woman as shown in Table 2.

In regard to anastomotic leak in the non-ileostomy group, only one patient received neoadjuvant chemoradiotherapy preoperatively, whereas the remaining six patients did not receive it. The anastomosis was done by hand sewn in five patients and by stapler for the remaining two patients. The anastomotic leaks were detected in three patients with anterior resection, two patients with low anterior, and two patients with ultralow anterior resection. The patients were three men and four women out of seven, as illustrated in Table 2.

No statistically significant correlations between anastomosis technique (P=1.000), neoadjuvant chemoradiotherapy (P=0.333), level of resection (P=1.000), or sex (P=1.000) and the occurrence of anastomotic leak with or without ileostomy formation were found.

Table 2. Association between anastomotic leak with/without ileostomy performance with anastomosis technique, neoadjuvant chemoradiotherapy, level of resection, and sex

Parameters	Anastomotic leak with or without ileostomy performance		Total patients with a leak	P value*
	Anastomotic leak with ileostomy group (22 patients)	Anastomotic leak without ileostomy (33 patients)		
Total number of patients with leakage	1 (4.54%)	7 (21.21%)	8**(14.54%)	1.000
Anastomosis technique	Hand sewn	0 (0.00%)	5 (15.15%)	1.000
	Stapler	1 (4.54%)	2 (6.06%)	

Table 2. Association between anastomotic leak with/without ileostomy performance with anastomosis technique, neoadjuvant chemoradiotherapy, level of resection, and sex

Parameters		Anastomotic leak with or without ileostomy performance		Total patients with a leak	P value*
		Anastomotic leak with ileostomy group (22 patients)	Anastomotic leak without ileostomy (33 patients)		
Neo adjuvant C/R	Yes	1 (4.54%)	1 (3.03%)	2 (3.63%)	0.333
	No	0 (0.00%)	6 (18.18%)	6 (10.9%)	
Type of surgery (level of resection)	Anterior resection	0 (0.00%)	3 (9.09%)	3 (5.45%)	1.000
	Low anterior resection	0 (0.00%)	2 (6.06%)	2 (3.63%)	
	Ultra-low anterior resection	1 (4.54%)	2 (6.06%)	3 (5.45%)	
Sex	Male	0 (0.00%)	3 (9.09%)	3 (5.45%)	1.000
	Female	1 (4.54%)	4 (12.12%)	5 (9.09%)	

Generally, about patients with leak, there were five female patients out of eight (total number with leak) who developed leak, whereas three patients out of eight were men. Of 32 patients who underwent low and ultra-low anterior resection, five (15.62%) developed a leak; in comparison, three of 23 patients who underwent anterior resection (13.04%) developed a leak. There were two patients out of eight with a leak, received neoadjuvant chemoradiotherapy, whereas the remaining six patients did not receive. Of the eight patients, five were hand-sewn, whereas the remaining three were anastomosed with a stapler.

DISCUSSION

In the current study, the incidence of anastomotic leak was 14.54%. This is consistent with another study conducted by You et al., which reports the incidence as 3-23% (2). Furthermore, many other studies report an incidence of leak ranging from 3.3% to 28% (3,13-16).

Anastomotic leaks in this study among patients with rectal resection without ileostomy were a higher percentage than those who had undergone rectal resection accompanied by diverting ileostomy, although it was statistically not significant, possibly due to the relatively small frequency of patients who had anastomotic leaks, especially those with ileostomy, which led to limited statistical strength. Many previous studies support the role of ileostomy in reducing the risk of anastomotic leak (17-18). The guidelines for management of rectal carcinoma of the 2020 American Society of Colon and Rectal Surgeons have cited a meta-analysis collecting different comparative studies displaying that diverting ileostomy reduces the incidence of anastomotic leak (2,4). In contrast, many other studies reported the reverse (19-22).

Xu and others have reported that performing a concurrent

proximal ileostomy did not reduce the incidence of anastomotic leak postoperatively (1). Soltani and colleagues have not detected a single case of leak from the anastomotic site in their series, despite the absence of concurrent ileostomy (23). Furthermore, many researchers avoid creating an ileostomy due to its complications, such as fluid and electrolytes disturbances, cutaneous excoriation, prolapse of the ileostomy or retraction, and parastomal (24).

It is thought that very low anastomosis increases the incidence of anastomotic leak, meaning that the nearest to the anal verge has the highest chance of developing a leak (3,14,15,24). In our study, lower resection levels were significantly associated with a higher likelihood of performance of diverting ileostomy and there were slightly higher percentage of leak among patients who had undergone low and ultra-low anterior resection in comparison to patients who had undergone anterior resection reflecting a clinical tendency toward a higher incidence of anastomotic leak without ileostomy after lower levels of rectal resection, despite the lack of statistically significant correlations. Many other studies have taken into consideration other risk factors for anastomotic leak, such as smoking, high alcohol consumption, male sex, overweight, advanced ASA class, diabetes mellitus, lung diseases, renal diseases, vascular diseases, size of tumor, preoperative chemoradiotherapy, and the distance of anastomosis from the anal verge (25-26). A study conducted by Kong and others reports that anastomotic leak is associated with the use of collagen hemostat intraoperatively during anterior resection for rectal cancer (27).

In this study, patients were significantly more likely to offer neoadjuvant chemoradiotherapy whenever the resection level was lower, namely, middle and lower third

rectal cancer, and consequently, they were significantly more exposed to concurrent diverting ileostomy. It is thought that preoperative neoadjuvant chemoradiotherapy increases the risk of anastomotic leak (25,26,28). On the contrary, in the current study, despite lack of statistical significance, a smaller percentage of patients who received neoadjuvant chemoradiotherapy developed anastomotic leaks compared with those who did not receive neoadjuvant chemoradiotherapy. Soltani and colleagues have not detected any case of leak among patients who received neoadjuvant radiotherapy (23).

Many patients in our study had not received preoperative chemoradiotherapy, depending on the oncologist's decision, which is based on the European Society of Medical Oncology's recommendation, which advises preoperative chemoradiotherapy in patients with tumor size T3-T4, lymph node involvement, and sufficient remaining safe margin after resection (28).

In this study, despite the lack of statistical significance, a slightly higher percentage of patients with hand-sewn anastomosis developed anastomotic leaks compared with those with stapler anastomosis. Many studies consider stapled anastomosis superior to hand-sewn (29, 30). While a study conducted by Huh and others has reported that hand-sewn is safer (24).

In the current study, in spite of statistical non-significance, the male percentage with leaks was less than the female percentage. This is in contrast to other studies that consider male sex as a risk factor for anastomotic leak (25-26).

Limitations

The limitation is the relatively small number of patients with anastomotic leak, particularly those with ileostomy, which limits statistical power and increases the risk of type II error. Additionally, the cross-sectional design and subgroup inspection according to the level of resection may have been influenced by unmeasurable confounding factors affecting clinical decision-making. The lack of statistical significance should not be taken as proof of clinical equivalence and should be evaluated with caution.

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CONCLUSION

It is concluded that concurrent diverting ileostomy in surgeries, particularly low and ultra-low anterior resection, even if it does not prevent the anastomotic leak, might decrease the risk of developing an anastomotic leak, and if it does happen, it will make the course of treatment easier.

Recommendation:

It is recommended to conduct a multicentric study to ensure the findings are robust, applicable, and statistically sound, and to overcome the mentioned statistical limitations.

DECLARATIONS:

ETHICS APPROVAL AND CONSENT TO PARTICIPATE STATEMENT:

The study was approved by the Ethics Committee of the Basrah College of Medicine, Basrah, Iraq. Written informed consent was obtained from the patients enrolled in the study, and to support privacy and confidentiality, the unique identifying information of the patients was concealed during data collection.

CONSENT TO PUBLICATION:

Written informed consent was obtained from participants

AVAILABILITY OF DATA AND MATERIAL:

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

CONFLICT OF INTEREST:

The authors declare no conflict of interest related to this work.

AUTHORS' CONTRIBUTIONS:

The four authors contributed to the design and implementation of the research, to the analysis of the results, and to the writing of the manuscript.

ACKNOWLEDGMENTS:

The authors are grateful to all patients who agreed to participate in this study.

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