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Impact of perirenal fat distance on the development of rectal anastomotic leaks in patients undergoing laparoscopic low anterior resection

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ABSTRACT

Introduction: Anastomotic leakage remains a significant complication in rectal cancer surgery. Perirenal Fat Distance (PrFD), an anthropometric measure correlated with visceral fat, has been shown to impact outcomes in various laparoscopic procedures. However, its relationship with anastomotic leakage in laparoscopic rectal cancer surgery has not been well established.

Materials and Methods: This retrospective study included patients who underwent Laparoscopic Low Anterior Resection with Loop Ileostomy for rectal cancer between December 2022 and December 2024. PrFD was measured from preoperative contrast-enhanced CT scans, and anastomotic leakage was classified using the International Study Group of Rectal Cancer (ISREC) criteria. ROC curves were generated to determine the optimal cutoff values for PrFD. Multivariate Cox regression analysis used for determining indipendent prognostic factors for anastomosis leak.

Results: PrFD was found to be significantly associated with anastomotic leakage in laparoscopic rectal cancer surgeries. ROC analysis demonstrated that a PrFD cutoff of 22.35 mm had good sensitivity (72.7%) and specificity (70.0%), with an AUC of 0.815 (p=0.002). Patients with shorter PrFD had a higher incidence of hypoalbuminemia (59.1% vs. 30.0%; p=0.050) and perineural invasion (41.9% vs. 0.0%; p<0.001). Univariate analysis identified PrFD>22.35 mm as a significant risk factor for anastomotic leakage (OR: 6.222; p=0.016).

Conclusion: PrFD has been identified as an independent risk factor for anastomotic leakage. Its role in anastomotic leakage development in rectal cancer could be further established through prospective studies with larger cohorts, potentially leading to its widespread clinical use.

Keywords: Anastomosis leak, laparoscopy, mesorectal excision, perirenal fat distance, rectum cancertotal

Introduction

Many historical advancements have been made in the surgical treatment of rectal cancers over the past century. The adoption of sphincter-preserving surgical procedures, total mesorectal excision, and neoadjuvant chemoradiotherapy protocols has led to increased survival rates, reduced local recurrence, and improved quality of life standards for patients.[1] The implementation of minimally invasive surgical procedures has been particularly associated with enhanced quality of life and lower complication rate.[2]

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Colorectal anastomotic leaks remain a persistent complication following rectal cancer surgery. Various factors have been reported to influence the development of anastomotic leakage, including the anastomosis level, history of neoadjuvant therapy, the surgeon's experience, and nutritional risk assessments.[3]

One of the anthropometric measurements that may contribute to the development of anastomotic leakage is the determination of visceral fat ratio or parameters that correlate with visceral fat distribution.[4, 5] In recent years, Perirenal Fat Distance has emerged as a newly developed parameter with reported efficacy in various laparoscopic surgical procedures. This measurement, based on the axial sections of contrast-enhanced tomography, involves assessing the distance between the anterior corner of the Quadratus lumborum muscle and the dorsal edge of the left renal pole at the level where the renal vein exits. Several studies have reported an increased risk of complications in laparoscopic gastric, renal, and colonic surgeries in patients with greater Perirenal Fat Distance.[6-8]

Visceral fat assessment is a complex measurement that requires significant workload, whereas Perirenal Fat Distance is a simple distance measurement that can be obtained from a single axial imaging slice.[8] However, literature investigating the isolated relationship between Perirenal Fat Distance and anastomotic leakage remains limited. This study aims to evaluate the association between Perirenal Fat Distance and colorectal anastomotic leaks in laparoscopic rectal cancer surgeries.

Materials and Methods

Study Design

Ethical approval for the study was obtained from the Zonguldak Bülent Ecevit University Faculty of Medicine Ethics Committee with the approval dated 11/12/2024 and decision number 2024/22/8. After obtaining ethical approval, patients who underwent Laparoscopic Low Anterior Resection with Loop Ileostomy for rectal cancer at the Ministry of Health Zonguldak Atatürk State Hospital between December 2022 and December 2024 were retrospectively reviewed.

Inclusion Criterias

To ensure a homogeneous patient group, the study included patients who underwent surgery for rectal and rectosigmoid adenocarcinomas, whose surgical procedures were completed in accordance with total mesorectal excision (TME) principles, and who had a minimum of 12 lymph nodes dissected. Patients who underwent colorectal anastomosis using a standard 28 mm circular stapler, had complete clinicopathological data, and underwent curative surgery under elective conditions were included in the study.

Exclusion Criterias

To prevent bias and ensure a homogeneous distribution of the patient cohort, patients under 18 age, who underwent additional or different colon resections beyond low anterior resection for rectal or rectosigmoid tumors, those whose surgical procedures did not comply with TME principles, those who underwent abdominoperineal resection or Hartmann's procedure, those who underwent surgery under emergency conditions or received palliative surgery, those who had additional suture reinforcement after colorectal anastomosis with a circular stapler, patients with previous colorectal surgery, patients whose missing or poor-quality preoperative imaging and those with incomplete clinicopathological data were excluded from the study. Additionally, patients with a positive rectal air leak test, which could directly impact anastomotic leakage development, were excluded from the study.

Preoperative and Postoperative Evaluation

Only patients who underwent surgery with a diagnosis of rectal adenocarcinoma were included in the study. The age, gender, body mass index (BMI)[9], American Society of Anesthesiology (ASA) scores[10], history of diabetes, smoking history, and preoperative albumin levels of these patients were recorded. Hypoalbuminemia was defined as ≤3 g/dL.[11] Cancers were classified according to their localization: Tumors located within 5 cm above the dentate line were categorized as lower rectal cancers, those between 5-10 cm as mid-rectal cancers, and those between 10-15 cm as upper rectal cancers.[12]

Patients who received preoperative neoadjuvant therapy were also specifically noted. Pathological specimens were evaluated according to the 8th edition of the American Joint Committee on Cancer (AJCC) classification.[13] In the axial CT sections, the Perirenal Fat Thickness (PFT) distance was measured as the distance from the anterior aspect of the Musculus Quadratus Lumborum to the dorsal margin of the left kidney pole at the level where the renal vein exits.[7]

The anastomosis distance and amount of intraoperative bleeding, which could influence anastomotic leakage in Laparoscopic Low Anterior Resection procedures, were recorded. The grading of anastomotic leakage was determined based on clinical, radiological, and surgical criteria, as defined by the International Study Group of Rectal Cancer (ISREC) classification. According to this classification, Grade B and C leaks were categorized as the Leak group, while patients with no leakage or those with Grade A leaks requiring only conservative management were classified as the Non-Leak group.[14]

Statistical Analysis

Statistical analyses were conducted using IBM® SPSS® (Statistical Package for the Social Sciences) version 25 (IBM Corp., Armonk, NY, USA). The Kolmogorov–Smirnov test was applied to assess the distribution of numerical data, confirming a non-normal distribution. Categorical variables were expressed as frequency and percentage, while continuous variables were reported as median and interquartile range (IQR). To compare categorical data, the chi-square test was employed, whereas differences in continuous variables between groups were analyzed using the Mann–Whitney U test. The Receiver Operating Characteristic (ROC) curve was utilized to identify the optimal cutoff value for Perirenal Fat Distance (PrFD). Cutoff value and dependent Sensitivity and Specifity values calculated with Youden Index calculation. Additionally, multivariate Cox regression analysis was performed to determine factors independently associated with anastomotic leakage. A p-value of <0.05 was considered statistically significant in all analyses.

Results

After obtaining ethical approval, the data of 173 patients who underwent surgery for colorectal adenocarcinoma at Zonguldak Atatürk State Hospital between December 2022 and December 2024 were retrospectively reviewed. Seventy-nine patients were excluded due to having undergone surgery for colon cancer. Among the remaining 94 patients, 7 underwent emergency surgery, 2 underwent palliative surgery, and 1 did not meet total mesorectal excision (TME) principles, leading to their exclusion. Additionally, 4 patients were excluded because their preoperative imaging was performed at an external center, while 6 patients lacked preoperative imaging other than that conducted before neoadjuvant therapy. Furthermore, 15 patients were excluded due to undergoing conventional surgery, 6 due to abdominoperineal resection, and 2 due to conversion from laparoscopy to open surgery. As a result, a total of 51 patients were included in the study (Fig. 1).

According to the ISREC classification, there were 11 patients diagnosed with anastomotic leakage. Patients were categorized into Leak (n=11) and Non-Leak (n=40) groups. Demographic and clinicopathological findings were compared between the groups. Among demographic characteristics, the incidence of anastomotic leakage was significantly higher in patients with a history of diabetes (15.5% vs. 45.5%; p=0.030). Similarly, the rate of hypoalbuminemia was notably higher in patients with leakage (45.5% vs. 90.1%; p=0.004). Operative time was significantly longer in the Leak group (160 [150-180] vs. 350 [290-460]; p<0.001), and blood loss was also greater in patients who developed leakage (100 [100-150] vs. 200 [150-400]; p<0.001). When evaluating the anastomosis distance from the dentate line (ADDL), the distance was found to be shorter in the Leak group (7 [5-8] vs. 3 [2-6]; p<0.001). Length of hospital stay was also prolonged in the Leak group (7 [7-8] vs. 17 [14-25]; p<0.001). Additionally, PrFD was significantly greater in the Leak group (19.0 [19.0-22.1] vs. 25.9 [21.0-27.4]; p=0.001). Other demographic and clinicopathological variables were similarly distributed between the groups (Table 1).

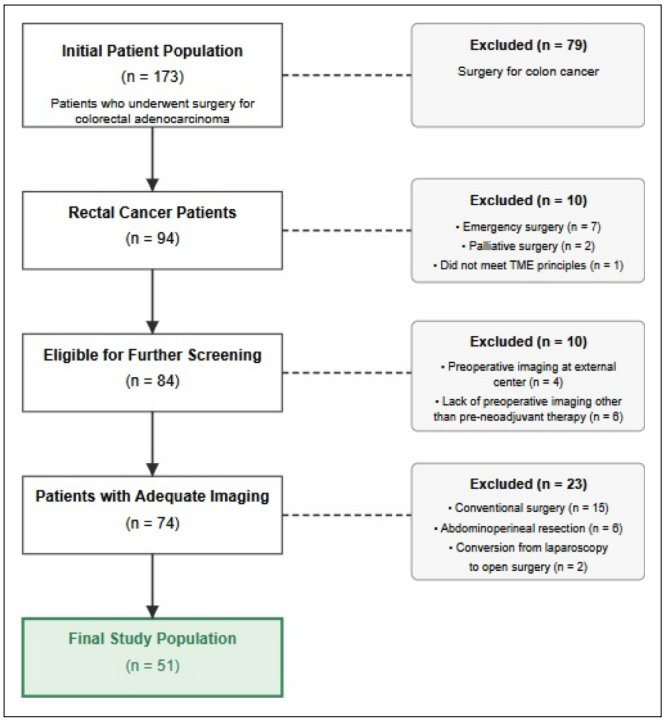

Figure 1. Flowchart of the Patient Enrollment.

Table 1. Demographic and clinicopathologic evaluation of patients based on anastomosis leak development

Variables	Non-leak (n=40) n (%)	Leak (n=11) n (%)	p†
Gender			
Male	21 (52.5%)	8 (72.7%)	0.230
Female	19 (47.5%)	3 (27.3%)	
ASA Score			
ASA II	9 (22.5%9	2 (18.2%)	0.758
ASA III	31 (77.5%)	9 (81.8%)	
DM			
No	34 (85.5%)	6 (54.5%)	0.030
Yes	6 (15.5%)	5 (45.5%)	
HT			
No	21 (52.5%)	7 (63.6%)	0.511
Yes	19 (47.5%)	4 (36.4%)	
CAD			
No	36 (90.0%)	8 (72.7%)	0.140
Yes	4 (10.0%)	3 (27.3%)	
CRF			
No	39 (97.5%)	10 (90.9%)	0.319
Yes	1 (2.5%)	1 (9.1%)	
Smoking			
No	33 (82.5%)	7 (63.6%)	0.178
Yes	7 (17.5%)	4 (36.4%)	
Hypoalbuminemia			
No	23 (57.5%)	1 (9.1%)	0.004
Yes	17 (42.5%)	10 (90.9%)	
Tumor Localization			
Upper	7 (17.5%)	3 (27.3%)	0.394
Middle	16 (40.0%)	2 (18.2%)	
Lower	17 (42.5%)	6 (54.5%)	
TNM Stage			
Stage I	12 (30.0%)	4 (36.4%)	0.742
Stage II	16 (40.0%)	3 (27.3%)	
Stage III	12 (30.0%)	4 (36.4%)	
T Stage			
T1	7 (17.5%)	3 (27.3%)	0.781
T2	5 (40.0%)	2 (18.2%)	
T3	21 (52.5%)	4 (36.4%)	
T4	7 (17.5%)	2 (18.2%)	
N Stage			
N0	26 (65.0%)	7 (63.6%)	0.517
N1	6 (15.0%)	3 (27.3%)	
N2	8 (20.0%)	1 (9.1%)	
LVI			
No	27 (67.5%)	7 (63.6%)	0.810
Yes	13 (32.5%)	4 (36.4%)	

Table 1. Cont.

Variables	Non-leak (n=40) n (%)	Leak (n=11) n (%)	p†
PNI			
No	29 (72.5%)	9 (81.8%)	0.530
Yes	11 (27.5%)	2 (18.2%)	
Grade			
Well Dif.	10 (25.0%)	5 (45.5%)	0.320
Moderate Dif.	27 (67.5%)	6 (54.5%)	
Poor Dif.	3 (7.5%)	0 (0.0%)	
Neoadjuvant History			
No	30 (75.0%)	7 (63.6%)	0.454
Yes	10 (25.0%)	4 (36.4%)	
	Median (IQR)	**Median (IQR)**	**p‡**
Age			
Years	62 [60-67]	59 [41-67]	0.449
BMI			
kg/m^2	24.8 [23.8-26.5]	26.4 [23.3-31.6]	0.443
TNLND	15 [12-24]	16 [13-19]	0.944
Surgery Duration			
minutes	160 [150-180]	350 [290-460]	<0.001
Bleeding			
ml	100 [100-150]	200 [150-400]	<0.001
LOS			
days	7 [7-8]	17 [14-25]	<0.001
ADDL			
cm	7 [5-8]	3 [2-6]	<0.001
PrFD			
mm	19.0 [19.0-22.1]	25.9 [21.0-27.4]	0.001

ASA: American Society of Anesthesiology; DM: Diabetes Mellitus; HT: Hypertension; CAD: Coronary Artery Disease; CRF: Chronic Renal Failure; LVI: Lymphovascular Invasioni; PNI: Perineural Invasion; BMI: Body Mass Index; TNLND: Total Number of Lymph Nodes Dysected; LOS: Length of Hospital Stay; ADDL: Anastomosis Distance to Dentate Line; PrFD: Perirenal Fat Distance. †: Chi-Square Test; ‡:Mann-Whitney U Test.

The ROC analysis for PrFD demonstrated that a cutoff value of 22.35 mm provided good sensitivity (72.7%) and specificity (70.0%). Patients with PrFD values above this threshold were identified as having a significant risk factor for anastomotic leakage, with an AUC of 0.815 (p=0.002). Additionally, other significant numeric parameters for anastomotic leakage were identified. The cutoff value for operative time was determined as 235 minutes (AUC: 0.987; p<0.001), while the ADDL was found to be 4.5 cm (AUC: 0.935; p=0.003). Similarly, a blood loss threshold of 350 mL was associated with a higher risk of anastomotic leakage (AUC: 0.883; p<0.001). All ROC analysis parameters related to PrFD are presented in Table 2.

When patients were evaluated based on the cutoff value of PrFD, it was observed that hypoalbuminemia was more common in patients with shorter PrFD (59.1% vs. 30.0%; p=0.050). Additionally, when analyzing N stage, N0 patients were more frequently found in the longer PrFD group (51.6% vs. 85.0%), whereas N2 patients were more common in the shorter PrFD group (29.1% vs. 0.0%; p=0.018). Perineural invasion was present in half of the patients with short PrFD, while none of the patients in the long PrFD group had perineural invasion (41.9% vs. 0.0%; p<0.001). When operative times were compared, longer PrFD was associated with prolonged surgical du-

Table 2. ROC analysis of PrFD

	AUC	SEAUC	95% CI	Cut-off	Sensitivity %	Specifity %	p
PrFD	0.815	0.081	0.655-0.974	22.35 mm	72.7%	70.0%	0.002

AUC: Area Under Curve; SEAUC: Standard Error for Area Under Curve; CI: Cınfidence Interval; PrFD: Perienal Fat Distance.

ration (160 [150-190] vs. 210 [170-290]; p=0.013). Similarly, intraoperative blood loss was found to be higher in the long PrFD group (100 [100-250] vs. 150 [150-250]; p=0.029). Finally, hospital stay duration was significantly longer in the long PrFD group (7 [7-8] vs. 13 [8-15]; p=0.007). Other demographic and clinicopathological variables showed a similar distribution between groups (Table 3).

Several factors were found to be significantly associated with the development of anastomotic leakage were included in the univariate analysis for identifying indipendent risk factors. A PrFD greater than 22.35 mm (OR: 6.222; p=0.016), an anastomosis distance from the dentate line greater than 4.5 cm (OR: 8.000; p=0.007), the presence of diabetes (OR: 4.722; p=0.039), and hypoalbuminemia (OR: 13.529; p=0.028) were all identified as risk factors. Additionally, blood loss exceeding 350 mL (OR: 14.625; p=0.028) and operative time longer than 235 minutes (OR: 34.444; p=0.002) were significantly associated with an increased risk of anastomotic leakage (Table 4).

Discussion

In laparoscopic low anterior resection procedures performed for the treatment of rectal cancers, a longer PrFD is associated with an increased risk of anastomotic leakage. The primary advantage of PrFD, a more easily calculated anthropometric measurement, is its clinical applicability. This study is the first to demonstrate an isolated relationship between PrFD and anastomotic leakage in laparoscopic rectal cancer surgeries, building upon its previously established role in colorectal cancer morbidity studies.

Rectal surgery is performed in a confined anatomical space, making it one of the most technically demanding procedures within the field of general surgery, requiring meticulous attention and a prolonged learning curve. While preserving sphincter function is a primary goal to maintain patients' quality of life, the most critical determinant in this decision-making process is the strict adherence to TME principles.[1,14] In deep-seated lesions, maintaining clear surgical margins and specimen integrity becomes even more challenging due to the narrow anatomical planes.[14] The adoption of laparoscopic surgical techniques has gained popularity, as it allows for better exploration of these confined spaces. Studies have demonstrated that laparoscopic surgery yields better pathological specimen quality and lower complication rates compared to conventional surgical methods. However, while laparoscopic surgery offers advantages, it is not the sole determining factor in preventing the development of anastomotic leakage.[15]

Several parameters, including nutrition, diabetes, advanced age, intraoperative blood loss, operative time, and ADDL levels, have been shown to be associated with rectal anastomotic leakage.[8] Some of these factors can be utilized in the preoperative period to assess risk. In particular, parameters directly related to wound healing serve as the foundation for risk analysis. Anthropometric body measurements not only correlate directly with pelvic anatomy but also provide insights into a broader spectrum, such as body fat-protein balance, offering valuable data for surgical risk assessment.[15]

Since fat balance is closely related to circulation and nutrition, studies evaluating malnutrition status have shown that increased visceral fat ratio in cross-sectional imaging is an independent risk factor for complications not only in rectal surgery but also in various other surgical procedures.[16-18] However, these analyses often require complex calculations, such as sequential axial section area assessments, making them time-consuming and limiting their routine clinical use despite their value. In contrast, Perirenal Fat Distance (PrFD) is a readily accessible parameter, as it is measured from a single cross-sectional image. Due to its ease of use, several studies have evaluated its potential role in risk assessment for surgical procedures.[7]

Table 3. Patients evaluations based on PrFD cutoff

Variables	PrFD <22.35 mm (n=31) n (%)	PrFD>22.35 mm (n=20) n (%)	p†
Gender			
Male	18 (58.1%)	11 (55.0%)	0.829
Female	13 (41.9%)	9 (45.0%)	
ASA Score			
ASA II	6 (19.4%)	5 (25.0%)	0.632
ASA III	25 (80.6%)	15 (75.0%)	
DM			
No	23 (74.2%)	17 (85.0%)	0.360
Yes	8 (25.8%)	3 (15.0%)	
HT No	14 (45.2%)	14 (70.0%)	0.082
Yes	17 (54.8%)	6 (30.0%)	
CAD			
No	25 (80.6%)	19 (95.0%)	0.146
Yes	6 (19.4%)	1 (5.0%)	
CRF			
No	30 (96.8%)	19 (95.0%)	0.750
Yes	1 (3.2%)	1 (5.0%)	
Smoking			
No	25 (80.6%)	15 (75.0%)	0.632
Yes	6 (19.4%)	5 (25.0%)	
Hypoalbuminemia			
No	13 (41.9%)	14 (70.0%)	0.050
Yes	18 (58.1%)	6 (30.0%)	
Tumor Localization			
Upper	4 (12.9%)	3 (15.0%)	0.956
Middle	12 (38.7%)	7 (35.0%)	
Lower	15 (48.4%)	10 (50.0%)	
TNM Stage			
Stage I	8 (25.8%)	8 (40.0%)	0.127
Stage II	10 (32.3%)	9 (45.0%)	
Stage III	13 (41.9%)	3 (15.0%)	
T Stage			
T1	5 (16.1%)	5 (25.0%)	0.550
T2	3 (9.7%)	4 (20.0%)	
T3	17 (54.8%)	8 (40.0%)	
T4	6 (19.4%)	3 (15.0%)	
N Stage			
N0	16 (51.6%)	17 (85.0%)	0.018
N1	6 (19.4%)	3 (15.0%)	
N2	9 (29.0%)	0 (0.0%)	
LVI			
No	18 (58.1%)	16 (80.0%)	0.105
Yes	13 (41.9%)	4 (20.0%)	
PNI			
No	18 (58.1%)	20 (100.0%)	<0.001
Yes	13 (41.9%)	0 (0.0%)	

Table 3. Cont.

Variables	PrFD <22.35 mm (n=31) n (%)	PrFD>22.35 mm (n=20) n (%)	p†
Grade			
Well Dif.	7 (22.6%)	8 (40.0%)	0.192
Moderate Dif.	21 (67.7%)	12 (60.0%)	
Poor Dif.	3 (9.7%)	0 (0.0%)	
Neoadjuvant History			
No	24 (77.4%)	13 (65.0%)	0.332
Yes	7 (22.6%)	7 (35.0%)	
	Median (IQR)	**Median (IQR)**	**p‡**
Age			
Years	63 [60-67]	58 [49-63]	0.239
BMI			
kg/m^2	25.5 [24.2-28.4]	25.3 [23.3-26.8]	0.481
TNLND	19 [13-25]	15 [12-19]	0.476
Surgery Duration			
minutes	160 [150-190]	210 [170-290]	0.013
Bleeding			
ml	100 [100-250]	150 [150-250]	0.029
LOS			
days	7 [7-8]	13 [8-15]	0.007
ADDL			
cm	7.0 [5.0-8.0]	5.5 [3.0-8.0]	0.522

PrFD: Perirenal Fat Distance; ASA: American Society of Anesthesiology; DM: Diabetes Mellitus; HT: Hypertension; CAD: Coronary Artery Disease; CRF: Chronic Renal Failure; LVI: Lymphovascular Invasioni; PNI: Perineural Invasion; BMI: Body Mass Index; TNLND: Total Number of Lymph Nodes Dysected; LOS: Length of Hospital Stay; ADDL: Anastomosis Distance to Dentate Line; †: Chi-Square Test; ‡:Mann-Whitney U Test.

In the literature, there are two studies evaluating a modified version of PrFD, specifically perirenal surface area measurements, in colorectal cancers. The first study, conducted in 2018 with 605 patients, reported that patients with a perirenal surface area >40 cm^2 had increased operative time, higher intraoperative blood loss, and higher surgical complication rates. However, the study stated that anastomotic leakage was not significantly affected in regression analyses, without further detailed assessment. Similarly, our study demonstrated that higher PrFD values were associated with prolonged operative time and increased intraoperative blood loss.[6]

In the second study, conducted with a cohort of 195 patients, perirenal surface area was again found to be associated with increased intraoperative blood loss, prolonged operative time, and extended hospital stay. However, no significant difference was observed in the development of major complications or anastomotic leakage. Similarly, our study demonstrated a correlation between PrFD elevation and blood loss, operative time, and hospital stay duration. Notably, neither of the previous studies found an association between PrFD modifications and anastomotic leakage. Although the second study focused on rectal cancer, it primarily evaluated overall surgical complications rather than isolating anastomotic leakage. Additionally, in that study, 87 patients underwent either abdominoperineal resection or Hartmann's procedure, whereas our study specifically included only patients who underwent colorectal anastomosis following low anterior resection.[19]

The primary limitation of our study is its retrospective design. It was conducted within a limited time frame and on a restricted patient cohort. Although some factors necessary for assessing major complications were not included, a wide range of parameters potentially associated with

Table 4. Univariate analysis of variables effecting anastomosis leak

Variables	Univariate		
	OR	95% CI	p
PrFD			
> 22.35 mm	6.222	1.403-27.589	0.016
ADDL			
> 4.5 cm	8.000	1.772-36.127	0.007
DM			
Yes	4.722	1.085-20.544	0.039
Hypoalbuminemia			
Yes	13.529	1.577-116.043	0.018
Bleeding			
> 350 ml	14.625	1.343-159.227	0.028
Surgery Duration			
> 235 minutes	34.444	3.872-306.382	0.002

PrFD: Perirenal Fat Distance; ADDL: Anastomosis Distance to Dentate Line; DM: Diabetes Mellitus; OR: Odds Ratio; CI: Confidence Interval.

anastomotic leakage were analyzed. Another reason for the limited cohort size is the inclusion of only patients who underwent colorectal anastomosis. Despite these limitations, our study statistically demonstrated that PrFD is associated with other well-established risk factors for anastomotic leakage within a homogeneous patient group and across a broad spectrum of parameters.

Conclusion

The evaluation of PrFD in rectal cancers represents an easily accessible anthropometric measurement that allows for preoperative assessment of anastomotic leakage risk. If the findings of this limited cohort study are validated in larger prospective patient populations, PrFD has the potential to become a widely used and practical tool for predicting anastomotic leakage in rectal cancer surgery.

Disclosures

The records of patients who underwent laparoscopic rectum cancer procedures in the Department of Surgical Oncology at Zonguldak Ataturk State Hospital between December 2022 and December 2024 were reviewed.

Ethichs Committee Approval: Ethical approval for the study was obtained from the Zonguldak Bülent Ecevit University Faculty of Medicine Ethics Committee with the approval dated 11/12/2024 and decision number 2024/22/8.

Peer-review: Externally peer-reviewed.

Conflict of Interest: None declared.

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