

Functional and Oncological Outcomes after Anterior Resection for Rectal and Recto-Sigmoid Tumors: A Retrospective Study

Original Article

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ABSTRACT

Background: Colorectal cancer (CRC) is the third commonest cancer worldwide, as well as a leading etiology of cancer-related mortality.

Aim: To evaluate the short-term outcomes following anterior resection in cases with rectal and recto-sigmoid cancer regarding preoperative, oncological, and functional outcomes.

Patients and Methods: This was a retrospective investigation carried out at the Gastrointestinal Surgical Center (GISC), Mansoura University Hospitals, Egypt, performed on 70 patients who underwent AR (35 open and 35 laparoscopic) in the same center and completed at least two years of follow-up conducted over the period of one year, which provided at least a two-year follow-up.

Results: We found no statistically significant difference between the groups under investigation in terms of hospital stay, reoperation, reoperation time, and reoperation causes. In terms of results, we found no statistically significant difference between the groups under investigation in terms of types, anastomosis leakage, time of leakage in days, leakage management, intestinal obstruction, stricture, paralytic ileus, recurrence, and recurrence site. In contrast, patients had more affected as regarded to relation to sexual activity and post-morbidity in open groups (22) 62.9% vs 12(34%) $p=0.02$. The tested groups differed statistically significantly in terms of sexual dysfunction kind and LARS score category.

Conclusion: The study found that both laparoscopic and open procedures for rectal cancer surgery could achieve radical resection, with laparoscopic surgical approaches being preferred for better sexual activity.

Key Words: CRC; GISC; Outcomes.

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INTRODUCTION

As the third most common kind of cancer globally, colorectal cancer is a significant cause of cancer-related death^[1].

With an anticipated 1070 cases in (2019) (not including colon cancer), rectal cancer ranks seventh among cancers in Egypt, affecting both sexes^[2].

Colonoscopies are used to diagnose rectal cancer in most cases after a lower gastrointestinal tract hemorrhage, while routine screening colonoscopies are used in a small number of cases^[3].

For rectal cancer, the current standard of therapy is total mesorectal excision on the holy plane of Heald. Five centimeters of mesorectum below the tumor is excised in

partial mesorectal excision, which is reserved for raised rectal and rectosigmoid tumors^[4].

The purpose of this study was to evaluate the short-term oncological, preoperative, and functional outcomes of anterior resection in patients of rectal and recto-sigmoid cancer.

PATIENTS AND METHODS

This was a retrospective investigation carried out at the Gastrointestinal Surgical Center (GISC), Mansoura University Hospitals, Egypt, performed on 70 patients who underwent AR (35 open and 35 laparoscopic) in the same center and completed at least two years of follow-up conducted over the period of one year, which provided at least a two-year follow-up.

Inclusion criteria

Adult cases aged between eighteen and eighty years, diagnosed with rectal cancer, and patients undergoing AR in our center during the previous study period via either open or laparoscopic approaches.

Exclusion criteria

Patients lost to follow-up and patients with peritoneal nodules or ascites who underwent exploration or palliative diversion.

Methods

All patients have been subjected to laboratory investigations, clinical examination, history taking, colonoscopy, radiological investigations, and anesthetic consultation.

Preoperative preparation

Patients received standard bowel preparation, corrected low albumin or hemoglobin levels, recommended a liquid diet three days before surgery, and initiated subcutaneous heparin for high-risk patients.

The operative procedure

The patient underwent a surgical procedure using open or laparoscopic approaches, with the latter using five ports. Abdominal exploration was done to exclude metastasis or peritoneal nodules, and the sigmoid colon was mobilized. The resection began at the junction of the sigmoid colon and left colon, and high ligation was carried out on the superior hemorrhoidal vessels. Sympathetic nerves were preserved, and total mesorectal excision has been carried out in all cases. The dissection was continued to four to five centimeters beyond the lower border of the tumor to respect the downward spread zone. The colorectal anastomosis was performed manually or with staples, and the diverting ileostomy was performed based on the case's status and the surgeon's experience. The abdominal incision was closed, and the patient's operation time, blood transfusion needs, loss of blood, and complications were recorded.

Post-operative care

Following the operation, cases have been transferred to the recovery room and inward, unless ICU admission was recommended. Analgesia was maintained with IV acetaminophen and ketorolac, and IV morphine was commenced if pain was reported. Early mobilization was recommended, and IV fluids were given daily until oral intake. If the patient had good intestinal sounds or passed flatus, oral fluids were introduced on the fourth or fifth postoperative day. If all went according to plan, cases were released on the sixth or seventh postoperative day. Ileus, surgical site infection, urine retention, and anastomotic leakage were among the early postoperative problems^[5]. In addition to peri-incisional hyperaemia, surgical site infection (SSI) was defined as the release of purulent secretions via the surgical wound^[6]. If at least two of the five symptoms listed below are present on or

after the fourth postoperative day and have not improved after the procedure, this is known as post-operative ileus^[7]. I: vomiting and nausea; II: difficulty to accept a solid or semi-liquid food for the last 24 hours; III: absence of gas or stool for the previous 24 hours; V: abdominal distension; and IV: radiographic evidence of ileus. Early mortality is defined as passing away within 30 days following surgery, or within the same hospital stay if it takes longer^[8].

Follow-up

Patients after surgery were regularly followed, with the first visit scheduled two to three weeks after surgery. They were then followed every 3 months for the initial three years, then every 6 months for the 4th and 5th years, and every year. Patients were referred to the medical oncology department for adjuvant chemoradiation. Clinical, radiological, and laboratory evaluations were conducted during these visits. Adhesion-related bowel obstruction has been diagnosed throughout emergency operation, while incisional hernia was diagnosed through clinical examination. Functional outcomes included the incidence of anterior or low anterior resection syndrome (LARS) and sexual dysfunction^[9,10].

Outcomes

Primary outcome: Functional and oncological outcomes and early complications after AR for rectal cancer. Secondary outcomes: Preoperative morbidity and mortality

Ethical consideration

The investigation protocol has been accepted by the local ethical committee and Institutional Review Board (IRB) of the Faculty of Medicine, Mansoura University.

Statistical analysis and data interpretation

SPSS software, version 25 (SPSS Inc., PASW Statistics for Windows version 25), was used to analyze the data. Chicago, Illinois: SPSS Inc. Qualitative data has been described using numbers and percentages. For quantitative data that was not regularly distributed, the mean was utilized, and the median (minimum and maximum) was utilized. After testing for normality using the Kolmogorov-Smirnov test, the standard deviation of normally distributed data is calculated. The significance of the findings was evaluated at the " ≤ 0.05 " level. When necessary, the Monte Carlo, chi-square, and Fisher exact tests have been used to compare the qualitative data between the groups. The non-normally distributed data from the two groups under investigation have been compared using the Mann Whitney *U* test. Normally distributed data has been compared among two independent groups utilizing the Student *t*-test.

RESULTS

According to this demographic data, a statistically insignificant distinction has been observed among examined groups regarding gender, age, and BMI with

a p -value <0.05 . According to comorbidities, we found that there was no statistically significant difference between examined groups with p -value <0.05 . Regarding neoadjuvant therapy, adjuvant therapy, and types of resections between examined groups, we observed that there was a statistically significant distinction among examined groups regarding neoadjuvant therapy, anterior resection, and types of adjuvant therapy, while there were statistically significant differences as regards types of anastomoses in both examined groups (Table 1).

Table (2) showed that regarding histopathological findings and operative data, we revealed that a statistically significant distinction has been observed among examined groups regarding perineural invasion, microvascular emboli, tumor differentiation grade, tumor category, N-category, number of lymph node HARVEST, safety margin positivity, and stoma use.

Table 5 showed that regarding hospital stay, reoperation time, and causes, we observed that a statistically insignificant distinction among examined groups regarding hospital stay, reoperation, reoperation time, and causes of reoperation.

According to Table (3), we found that there was no statistically significant difference between the groups that were examined in terms of types, management of morbidities, anastomosis leakage, time of leakage in days, leakage management, intestinal obstruction, stricture, paralytic ileus, recurrence, and recurrence site. However, there has been a more statistically significant difference between the groups under investigation in terms of sexual activity and post-morbidity in the open group. There is a statistically significant difference between the groups under investigation in terms of sexual dysfunction type and LARS score category.

Table 1: Comparison of demographic characteristics, associated comorbidities of examined groups and neoadjuvant therapy, adjuvant therapy, and resection:

	Open N= 35	Laparoscopic N= 35	Test of significance
Age / years Mean $\pm$ SD	57.89 $\pm$ 11.92	53.6 $\pm$ 11.26	$t= 1.55$ $p= 0.125$
Sex n (%)			
Male	25(71.4)	19(54.3)	$\chi^2= 2.20$
Female	10(28.6)	16(45.7)	$p= 0.138$
BMI (kg/m ²) Mean $\pm$ SD	33.20 $\pm$ 4.65	32.63 $\pm$ 3.20	$t= 0.599$ $p= 0.551$
Comorbidities			
Free	20(57.1)	22(62.9)	
Hypertension	6(17.1)	6(17.1)	
DM	4(11.4)	3(8.6)	Mc= 2.44
Cardiac	2(5.7)	0	$p= 0.786$
Hypertension& DM	2(5.7)	3(8.6)	
Hypertension &cardiac	1(2.9)	1(2.9)	
Neoadjuvant	5(14.3)	4(11.4)	$\chi^2= 0.128$ $p= 0.721$
Anterior resection			
High	16(45.7)	19(54.3)	$\chi^2= 0.514$
Low	19(54.3)	16(45.7)	$p= 0.473$
Types of anastomosis			
Manual	14(40.0)	0	$\chi^2= 17.5$
Stapler	21(60.0)	35(100)	$p= 0.001^*$
Adjuvant therapy	29(82.9)	35(100)	$\chi^2= 6.56$ $p= 0.01^*$

χ^2 : Chi-square test; MC: Monte Carlo test; t : Student t test; *: Statistically significant; FET: Fisher exact test.

OUTCOMES AFTER ANTERIOR RESECTION

Table 2: Comparison of BLOOD LOSS, histopathological findings and operative data among examined groups:

	Open N= 35	Laparoscopic N= 35	Test of significance
Blood loss			$z= 0.424$
Median (min-max)	100(50-1500)	100(50-400)	$p= 0.671$
Operative time			$t= 5.29$
Mean±SD	3.28±0.62	4.54±1.0	$p= 0.001^*$
Blood transfusion			FET= 1.06
N(%)	3(8.6)	1(2.9)	$p= 0.614$
Perineural invasion			$\chi^2= 0.068$
	24(68.6)	(71.4)25	$p= 0.794$
Microvascular emboli			FET= 0.0
	13(37.1)	(37.1)13	$p= 1.0$
Tumor differentiation grade			
No residual tumor	1(2.9)	(2.9)1	
Well differentiated	0	(8.6)3	
Moderately differentiated	30(85.7)	(62.9)22	Mc= 10.68
Poorly differentiated	2(5.7)	(25.7)9	$p= 0.058$
Undifferentiated	1(2.9)	0	
Benign	1(2.9)	0	
Tumour category			
Free	1(2.9)	(2.9)1	
T1	1(2.9)	0	Mc= 8.38
T2	9(25.7)	(5.7)2	$p= 0.079$
T3	21(60.0)	(88.6)31	
T4	3(8.6)	(2.9)1	
N- Category			
FREE	0	(2.9)1	
N0	20(57.1)	(48.6)17	Mc= 2.78
N1	11(31.4)	(25.7)9	$p= 0.427$
N2	4(11.4)	(22.9)8	
Free	2(5.7)	(2.9)1	
I	5(14.3)	(2.9)1	
IIA	6(17.1)	(37.1)13	
IIB	7(20)	(2.9)1	Mc= 11.15
IIIA	3(8.6)	(5.7)2	$p= 0.084$
IIIB	8(22.9)	(31.4)11	
IIIC	4(11.4)	(17.1)6	
Number of lymph node HARVEST			$Z= 0.577$
Median (min-max)	13(5-31)	16(2-54)	$p= 0.564$
Safety margin positivity (distal) n(%)	1(2.9)	(2.9)1	$p= 1.0$
Stoma use n(%)	18(51.4)	19(54.3)	$\chi^2= 0.057$
			$p= 0.811$

Z: Mann Whitney *U* test; *: Statistically significant; FET: Fisher exact.

Table 3: Comparison of hospital stays, reoperation time, and causes between examined groups:

	Open N= 35	Laparoscopic N= 35	Test of significance
Hospital stay (days)			$Z= 1.42$
Median (min-max)	9(5-30)	(4-22)9	$p= 0.153$
Re-operation n(%)			FET =0.0
	2(5.7)	(5.7)2	$p= 1.0$
Reoperation time (days)			$Z 0.775$
Median (min-max)	7(4-10)	(1-7)4	$p= 0.439$
Causes of re-operation n(%)			
Bleeding	N=20	N=2	
Leak	2(100)	(50)1	$p= 1.0$
		(50)1	

Z: Mann Whitney *U* test; FET: Fisher exact.

Table 4: Outcome among examined cases:

	Open N= 35	Laparoscopic N= 35	Test of significance
Post morbidity	32(91.4)	(68.6)24	$\chi^2= 5.71$ $p= 0.017^*$
Types			
Type I	11(34.4)	(45.8)11	Mc= 1.96 $p= 0.580$
Type II	12(37.5)	(25.0)6	
Type IIIA	8(25.0)	(29.2)7	
Type IIIB	1(3.1)	0	
Management of morbidities			
Conservative	30(93.8)	(95.8)23	FET= 0.117 $p= 1.0$
Surgical	2(6.3)	(4.2)1	
Anastomosis leakage	4(11.4)	4(11.4)	$p= 1.0$
Time of leakage in days	8(4-14)	7(5-7)	Z= 0.180 $p= 0.857$
Leakage management	N= 4	N= 4	$p= 1.0$
Conservative	2(50)	2(50)	
Exploration	2(50)	2(50)	
Paralytic ileus	18(51.4)	17(48.6)	$\chi^2= 0.057$ $p= 1.0$
Stricture	0	1(2.9)	FET= 1.01 $p= 1.0$
Intestinal obstruction	3(8.6)	2(5.7)	FET= 0.215 $p= 1.0$
Mortality	0	0	
Recurrence	12(34.3)	7(20.0)	$\chi^2= 1.81$ $p= 0.179$
Recurrence site	N=12	N=7	MC= 2.81 $p= 0.245$
Local	8(66.7)	2(28.6)	
Systemic	3(25.0)	3(42.9)	
Local and systemic	1(8.3)	2(28.6)	
LARS score category			
NO LARS	7(20)	18(51.4)	$p= 0.006^*$
MINOR LARS	22(62.9)	14(40.0)	$p= 0.06$
Major LARS	6(17.1)	3(8.6)	$p= 0.28$
Micturition problems	2(5.7)	1(2.9)	FET= 0.348 $p= 0.555$
Sexual dysfunction	22(62.9)	12(34.3)	$\chi^2= 5.72$ $p= 0.02^*$
Type of sexual dysfunction			
Impotence	21(95.5)	7(53.8)	$\chi^2= 8.84$ $p= 0.003^*$
Ejaculation problems	1(4.5)	6(46.2)	

*: Statistically significant; FET: Fisher exact test.

DISCUSSION

Our research revealed that, based on demographic information, a statistically insignificant difference in age, sex, and BMI was found between the groups under investigation (p -value <0.05).

Fifty instances of upper rectal cancer were investigated by El Maghrabi *et al.*,^[11]. In keeping with their goal of comparing the results of laparoscopic and open surgical procedures in colorectal cancer localised in the rectosigmoid area, the patients underwent anterior resection either by open surgery (1st group) or by laparoscopy (2nd group). They said that, with a p -value <0.05, a statistically insignificant

difference between the groups under investigation in terms of age and sex had been found.

We demonstrated in our studies that, with respect to neoadjuvant therapy, adjuvant therapy, and resection between examined groups, there were statistically significant differences in the types of anastomoses among examined groups, but a statistically insignificant difference in the types of mesorectal resection, anterior resection, neoadjuvant therapy, and types of adjuvant therapy among examined groups.

Additionally, Stevenson *et al.*,^[12] conducted an investigation that aimed to ascertain whether laparoscopic

resection is noninferior to open rectal cancer resection in terms of the adequacy of cancer clearance. The investigation included 194 cases (eighty-two percent of the total) in the laparoscopic operation group and 208 cases (eighty-nine percent) in the open operation group. They demonstrated that a variance in the proportion of successful resections was lesser at four percent with respect to the therapy received (eighty-three percent for the laparoscopic operation group and eighty-seven percent for the open operation group, p -value equals 0.11).

In our study, we showed that according to need for transfusion and loss of blood, our result revealed that a statistically insignificant distinction has been observed among examined groups regarding loss of blood, blood transfusion, and number of units transfused, while there was a higher statistically significant distinction among examined groups regarding operative time in laparoscopic with a p -value <0.001.

Additionally, the study, which was carried out on 240 cases with laparoscopic resection and 222 with open resection, was evaluable for analysis of the enrolled 486 in accordance with the meta-analysis carried out by Flesham *et al.*^[13] to determine whether laparoscopic resection is noninferior to open resection, as determined by gross pathologic and histologic assessment of the resected proctectomy specimen. They showed that a greater operating time has been associated with laparoscopic procedures. The percentage of abdominoperineal resection was 34.7% in open surgery and 28.3% in laparoscopic surgery due to the patient's features (low rectal malignancy). In our study, we showed that, according to histopathological findings and operative data, we revealed that a statistically insignificant distinction has been observed among examined groups regarding perineural invasion, microvascular emboli, tumor differentiation grade, tumor category, N-category, number of lymph node harvests, safety margin positivity, and stoma use.

Also, Prakash *et al.*,^[14] found that the technical treatment and histopathological examiner are important factors in evaluating the specimen and counting the number of lymph nodes. Tumor grade and location of the tumor are the factors affecting the number of lymph nodes removed. There was a significant distinction in the mean maximum lymph node harvested in a single patient between two groups. The maximum lymph node harvested in a single patient was highest in the laparoscopy group. A significant distinction has been observed in the mean minimum lymph nodes harvested in a single patient between two groups.

In our study, we demonstrated that a statistically insignificant difference has been found between the groups under investigation with respect to hospital stay, reoperation, reoperation time, and reoperation reasons.

According to Stevenson *et al.*,^[12] there is a statistically negligible difference between the groups under investigation in terms of hospital stay and reoperation.

In terms of the results, we found that there was no statistically significant difference between the groups that were analyzed in terms of types, morbidity management, anastomosis leakage, time of leakage in days, leakage management, intestinal obstruction, stricture, paralytic ileus, recurrence, recurrence site, and urinary complications. In contrast, there has been a more statistically significant difference between the groups under investigation with relation to sexual dysfunction and post-morbidity in open groups. There is a statistically significant difference between the groups under investigation in terms of sexual dysfunction and LARS score category.

In agreement with Stevenson *et al.*,^[12] it was determined that there were no distinctions in surgical particulars among the two groups. Both groups achieved ninety-seven percent of the planned sphincter preservations, with a relatively low rate of permanent stomata (ten percent) and a high proportion of coloanal anastomoses (twenty-seven percent). In general, the mortality rate after thirty days was low (0.6 percent; one case in the laparoscopy group and two cases in the open operation group). The clinical anastomotic leak rate was seven percent in general, with three percent for clinically important grade three or four leaks. Major complications did not exhibit any significant distinctions.

In our study, we showed that concerning surgical procedure, our findings revealed that there was no statistically significant relation among median disease-free survival and types of operative approach.

In agreement with Flesham *et al.*,^[13] who aimed to determine the disease-free survival (DFS) and recurrence following the management of cases with rectal cancer with open (OPEN) or laparoscopic (LAP) resection. They found that 2-year disease-free survival was LAP 79.5% and OPEN 83.2%, with no statistical distinction observed among LAP and open groups.

CONCLUSION

We concluded from our study that both laparoscopic and open procedures for rectal cancer operations could achieve the same radical resection, supporting its continued use in the management of this illness; however, the open surgical approach is characterized by shortening in operative time and in resection of large masses (more than 7cm) that are difficult to be dissected or excised by laparoscope and in major bleeding difficult to be controlled by laparoscope, while laparoscopic surgical resection is characterized by better sexual activity and early postoperative morbidities.

RECOMMENDATIONS

Additional investigations with larger sample sizes are needed to confirm the current outcomes. Additional study is needed to fully understand the clinical implications of these findings. Further investigations with longer monitoring are needed to evaluate the short-term outcomes following anterior resection in cases with rectal and rectosigmoid cancer regarding preoperative, oncological, and functional outcomes.

CONFLICT OF INTERESTS

There are no conflicts of interest.

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