

Bowel functions and quality of life after colorectal surgery

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Aim

The aim of the study was to evaluate bowel functions and quality of life (QOL) after rectal or colonic surgery.

Patients and methods

The study included 108 patients obtained from a retrospective patient database performed in Ain Shams University Hospital and Minia University Hospital by using prospective validated questionnaires. It included patients who performed colorectal surgery either for benign or malignant conditions. We evaluated these functional problems as regards sex, age, length of follow-up, type of surgery whatever the cause benign or malignant, receiving neoadjuvant and adjuvant therapy, and the effect of laparoscopic surgery compared with open surgery.

All the benign cases were done laparoscopic, which were 13 cases with sigmoid volvulus untested by colonoscopy and prepared for elective resection and nine cases with diverticulosis coli resistant to treatment and developed multiple attacks of diverticulitis prepared for elective resection.

Results

Neoadjuvant chemoradiotherapy (CRT) significantly affects the severity of bowel functions ($P=0.004$). The type of operation had no statistically significant effect on bowel functions with the lowest score after low anterior resection. QOL is found to be affected significantly in patients receiving neoadjuvant CRT as regards secondary endpoints of general health, pain, emotional well-being, and social functions. Adjuvant chemotherapy has no significant effect on QOL in males or females. This study showed a nonsignificant difference neither in male or female bowel functions nor QOL after laparoscopic or open rectal resection.

Conclusion

We concluded that neoadjuvant CRT is the main risk factor for bowel dysfunctions and bad QOL.

Keywords:

neoadjuvant chemoradiation, quality of life, rectum surgery

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Patients and methods

Patients

This study included 108 patients who performed rectal or colonic surgery for malignant or benign conditions, either done open or laparoscopically at Ain Shams University Hospital and Minia University Hospital, and who met the inclusion criteria from January 2012 to January 2016. This study was approved from the ethical committee of faculty of medicine Minia university. Patients participated in the study either by the upcoming clinic appointment or by mailing an introductory letter or by telephonic conversation.

Inclusion criteria

- (1) Sex: both sexes were included.
- (2) Age: 16 years or older.

Exclusion criteria

- (1) Patients who were dead for any reason.

- (2) Severe mental and/or physical handicap.
- (3) Local recurrences for malignant cases.
- (4) Patients with temporary or permanent colostomy were excluded from bowel-function assessment.
- (5) Patients who were unwilling to participate.

Methods

Informed consent was obtained from all participants, and the purpose of the study was stated verbally to the participant before asking for his or her consent to participate. Data were kept confidential by replacing names on the questionnaires with a code number; all patients who accepted the study completed validated and specific questionnaires to assess their problems. All questionnaires were translated in Arabic and the results

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were analyzed and expressed in English. No objective or subjective data regarding the patient's preoperative functional statuses were available.

The following data were recorded (Appendix 1): age at questionnaire completion, sex, surgical procedure, and type of intestinal reconstruction if any, early and late major complications, neoadjuvant treatment schedule, and adjuvant treatment received.

Recruitment and data collection

Quality-of-life assessment

Short Form 36 questionnaire (Appendix 2) consists of 36 items that assess eight dimensions of health from the patients' viewpoint, these dimensions measure physical functioning, role limitations because of physical or emotional problems, social functioning, mental health, energy and vitality, body pain, and general health perception [1]. All questions are scored on a scale from 0 to 100, with 100 representing the highest level of functioning possible.

Bowel-function assessment

The Memorial Sloan-Kettering Cancer Center Bowel Function Instrument (Appendix 3) is the questionnaire used for evaluating bowel function [2]. It consists of 18 questions, for each question, the five frequency options range from never through to always (except for one question asking about the number of bowel movements per 24 h). A global score is calculated as the sum of the subscale scores, and a total score is calculated by adding all the subscale plus single-item scores. A higher score represents better bowel function.

Statistical analysis

The collected data were coded, tabulated, and statistically analyzed using SPSS program (Statistical Package for Social Sciences) software, version 20. Statistical analysis was done using IBM SPSS statistics for windows, Version 23.0. Armonk, NY: IBM Corp. Descriptive statistics were done for numerical data by mean, SD, and minimum and maximum of the range, while they were done for categorical data by number and percentage. Analyses were done for parametric quantitative data between the three groups using one-way analysis of variance test, and for nonparametric quantitative data between the three groups using Kruskal–Wallis test. Analyses were done for parametric quantitative data between two groups using independent-sample *t* test, and for nonparametric quantitative data using Mann–Whitney test. Analyses were done for qualitative data using χ^2 test (if the number per cell >5) and Fisher exact test (if the number per cell <5).

Correlation between two quantitative variables was done by using Pearson's correlation coefficient. The correlation coefficient ranges from 0 to 1: weak ($r=0-0.24$), fair ($r=0.25-0.49$), moderate ($r=0.5-0.74$), and strong ($r=0.75-1$).

Results

Sample

The patient database consisted of 201 patients, of those 35 patients were dead at the time of study conduction, six patients refused to complete the questionnaires, 30 patients were unreachable, and 22 patients were excluded either due to development of local recurrence or leak or due to other causes that were mentioned in the exclusion criteria. The final sample was 108 patients, 59 males and 49 females.

Patient demographic and clinical data

Details of patient characteristics, neoadjuvant therapy, operative procedures, and adjuvant therapy are given in Table 1.

Bowel functions

Neoadjuvant chemoradiotherapy (CRT) significantly affects the severity of bowel functions ($P=0.004$). The type of operation had no statistically significant effect on bowel functions with the lowest score after low anterior resection (LAR) (Table 2).

Quality of life

Table 3 shows a positive correlation and better quality of life (QOL) with age more than 55 years in males with statistically significant differences in the secondary endpoint of physical functions, pain, general health, and limitation due to emotional problems.

Table 4 shows significantly improved QOL with duration in males and females in the secondary endpoints of general health, physical limitation, emotional limitation, and social function.

As regards the type of operation and QOL, there was a significant difference in the secondary endpoint of general health and emotional well-being ($P=0.030, 0.020$) with the lowest functions after abdominoperineal resection (APR) (Table 5).

QOL is found to be affected significantly in patients receiving neoadjuvant CRT as regards secondary endpoints of general health, pain, emotional well-being, and social functions (Table 6) Adjuvant chemotherapy has no significant effect on QOL in males or females.

Table 1 Patient characteristics and clinical data

Patients characteristics	All patients' characteristics [n (%)]	Male patients' characteristics [59 (54.6%)] [n (%)]	Female patients' characteristics [49 (45.4%)] [n (%)]
Age (mean±SD)	44.14±15.67	43.54±15.41	44.87±16.09
Duration (mean±SD)	31.65±28.44	32.11±30.47	31.1±26.07
Type of operation			
Open LHC	5 (4.6)	4 (6.8)	1 (2)
Laparoscopic LHC	7 (6.5)	4 (6.8)	3 (6.1)
Open LAR	28 (25.9)	14 (23.7)	14 (28.6)
Laparoscopic LAR	20 (18.5)	11 (18.6)	9 (18.4)
Open APR	16 (14.8)	7 (11.9)	9 (18.4)
Laparoscopic APR	10 (9.3)	5 (8.5)	5 (10.2)
Benign	22 (20.4)	14 (23.7)	8 (16.3)
Operations			
Neoadjuvant			
Long course	44 (40.7)	18 (30.5)	26 (53.1)
Short course	1 (0.9)	1 (1.7)	0
No	63 (58.3)	40 (67.8)	23 (46.9)
Adjuvant			
Yes	66 (61.1)	37 (62.7)	29 (59.2)
No	42 (38.9)	22 (37.3)	20 (40.8)

APR, abdominoperineal resection; LAR, low anterior resection; LHC, left hemicolectomy.

Table 2 Correlation between bowel functions and operation and neoadjuvant

Neoadjuvant				P value
Bowel function	Bowel total	Long course	No	0.004*
		53.11±8.93	58.67±5.53	
Operation				P value
Bowel function	Bowel total	Left hemicolectomy	LAR	0.416
		58.4±4.64	55.8±7.69	
		APR	Benign	
			59±6.78	

APR, abdominoperineal resection; LAR, low anterior resection. *P value is considered significant if less than 0.05.

Table 3 Correlation between quality of life and age in males

In males	Age		P value
	<55	≥55	
Quality of life			
Physical function	76.21±21.21	88.33±18.62	0.041*
Pain	67.86±26.71	83.19±21.17	0.036*
General health	57.8±18.02	68.88±17.36	0.032*
Limitation physical health	47.56±48.02	62.5±48.69	0.278
Limitation emotional problem	44.75±46.27	79.62±36.41	0.006*
Energy fatigue	52.07±21.03	63.05±16.37	0.054
Emotional well-being	62.63±17.87	66.66±16.57	0.419
Social functioning	67.37±29.43	81.41±19.96	0.071

*P value is considered significant if less than 0.05.

This study showed a nonsignificant difference neither in male or female bowel functions nor QOL after laparoscopic or open rectal resection (Table 7).

Discussion

Bowel functions

Our study demonstrates that multimodal therapy of low rectal cancer increases the severity of bowel dysfunction so that the potential benefits of CRT

need to be balanced against the risk of increased bowel dysfunction when determining the appropriate treatment for individual patients with rectal cancer. But the type of operation had no significant effect on bowel functions with the lowest score after LAR and this is in line with previous studies. In the Dutch colorectal cancer group study, patients who received preoperative pelvic radiotherapy compared with patients who did not receive pelvic radiotherapy reported increased rates of fecal incontinence (62 vs.

Table 4 Correlation between quality of life and duration in males and females

In males	Duration		P value
	<24	≥24	
Quality of life			
Physical function	74.28±21.2	85±19.91	0.051
Pain	68.03±25.23	76.61±26.35	0.208
General health	58.57±18.5	63.54±18.31	0.304
Limitation physical health	42.85±48.04	60.48±47.77	0.164
Limitation emotional problem	48.81±47.55	61.34±44.72	0.301
Energy fatigue	53.92±21.99	56.77±18.77	0.594
Emotional well-being	62.57±19.72	65.03±15.35	0.593
Social functioning	62.61±28.82	79.83±23.86	0.015*
In females			
Quality of life			
Physical function	54.11±25.26	73.33±28.29	0.025*
Pain	60±16.32	77.91±23.61	0.008*
General health	52.05±13.69	60.66±19.33	0.113
Limitation physical health	19.11±30.01	57.5±46.49	0.001*
Limitation emotional problem	27.45±42.87	65.58±47.48	0.009*
Energy fatigue	51.47±18.01	54.83±21.31	0.586
Emotional well-being	55.29±20.11	59.6±21.27	0.500
Social functioning	56.79±31.56	72.91±28.63	0.081

*P value is considered significant if less than 0.05.

Table 5 Correlation between quality of life and operation in males and females

Operation	Duration				P value
	Left hemicolectomy	LAR	APR	Benign	
Quality of life					
Physical function	85.41±23.2	74.06±24.72	66.25±26.22	75.68±26.19	0.192
Pain	83.95±24.24	72.39±22.89	65.72±25.01	71.7±26.64	0.218
General health	70.41±14.37	59.47±16.44	52.08±18.58	62.04±20.51	0.030*
Limitation physical health	75±41.28	50±46.12	33.33±44.02	46.59±50.17	0.090
Limitation emotional problem	80.55±36.12	59.04±48.22	32.01±44.43	51.51±45.68	0.020*
Energy fatigue	64.58±19.71	55.72±18.24	51.25±19.62	50.45±23.54	0.194
Emotional well-being	66.33±18.48	63.08±15.91	54.83±22.45	61.63±21.4	0.263
Social functioning	84.37±27.24	66.41±28.84	63.66±28.23	75.13±28.22	0.133

APR, abdominoperineal resection; LAR, low anterior resection. *P value is considered significant if less than 0.05.

Table 6 Correlation between quality of life and neoadjuvant

Neoadjuvant	Long course	N	P value
Quality of life			
Physical function	68.21±25.34	78.01±25.02	0.053
Pain	66.42±22.51	76.46±24.73	0.037*
General health	53.57±16.01	63.88±18.43	0.004*
Limitation physical health	40.47±44.15	54.36±48.05	0.137
Limitation emotional problem	48.47±48.88	58.2±45.97	0.303
Energy fatigue	53.45±19.52	55.31±20.71	0.645
Emotional well-being	56.28±19.8	64.82±18.07	0.025*
Social functioning	59±26.78	76.63±28.31	0.002*

*P value is considered significant if less than 0.05.

38%, respectively, $P<0.001$), pad wearing as a result of incontinence (56 vs. 33%, respectively, $P<0.001$), and mucus loss (27 vs. 15%, respectively) [3]. Dahlberg

et al. [4] retrospectively investigated the effect of preoperative pelvic radiotherapy after a minimum of 5 years of follow-up in a subset of 171 patients, they

Table 7 Urogenital, bowel functions, and quality of life after lap, and open rectal surgery in males and females

In males		Operation		P value
Questionnaire	Scores	Laparoscopic	Open	
Bowel function	Bowel total	58.2±7.19	54.86±6.77	0.251
Quality of life	Physical function	77±21.11	82±18.42	0.401
	Pain	70±28.64	78±21.42	0.290
	General health	60±16.85	62.6±17.91	0.622
	Limitation physical health	57.5±47.36	53±48.58	0.756
	Limitation emotional problem	55.08±47.38	62.66±46.46	0.592
	Energy fatigue	59.75±19.15	55±18.76	0.408
	Emotional well-being	70±13.26	61.76±18.76	0.092
	Social functioning	72.5±24.19	73.5±29.16	0.903
	In females		Operation	
Questionnaire	Scores	Laparoscopic	Open	
Bowel function	Bowel total	58.44±5.68	55.16±8.38	0.326
Quality of life	Physical function	3.36±0.98	2.72±1.26	0.117
	Pain	3±1.42	2.81±1.52	0.483
	General health	3.92±1.63	3.81±1.55	0.429
	Limitation physical health	3.38±1.77	3.38±1.46	0.180
	Limitation emotional problem	4.03±0.93	3.92±1.37	0.316
	Energy fatigue	3.6±1.44	3.16±1.45	0.572
	Emotional well-being	20.72±7.3	19.82±7.48	0.298
	Social functioning	75±24.96	60±31.04	0.080

also found that radiation was associated with increased bowel frequency, incontinence, urgency, and emptying difficulties. Bowel function was rated as poor in 7% of irradiated patients. However, none of the nonirradiated patients rated their function as poor. In the assessment of bowel function after a mean interval of 41 months from surgery in 100 patients, Kollmorgen *et al.* [5] found that patients who received postoperative pelvic radiotherapy reported more bowel movements per day than patients not receiving pelvic radiotherapy. Patients who received postoperative pelvic radiotherapy also experienced an increased frequency of clustering, occasional or frequent incontinence as well as increased usage of pads, and antidiarrheal medication. Recent evidence shows that besides surgery, preoperative radiotherapy may adversely affect sphincter function [4,6].

Quality of life

Pucciarelli *et al.* [7] recommended the use of validated questionnaires to provide standardized information on relevant health status areas. In the present study, interestingly, older male patients reported better QOL and we did not have an explanation for this. Vironen *et al.* [8] show that older patients (65–79 years) reported significantly better general health perception, physical functioning, mental health, energy and vitality, and less pain than their population controls. No such differences were found between the younger patients (40–64 years) and their controls. The type of surgery did not seem to have a significant impact on the QOL in our study, which is in

line with some earlier studies that used Short Form 36 questionnaire [9,10]. After APR, there was a tendency toward worse emotional well-being and social functions, but otherwise the differences were not statistically significant, which were also reported by Vironen *et al.* [8]. This is in contrast to other studies [10,11] where the QOL was not better after HAR than after LAR or APR, which may be explained by lower median-age population in these studies. This study reported significant improvement in the QOL with time in the subscale of general health, physical limitation, emotional limitation, and social function. This is in line with previous studies [10,11]. QOL is found to be affected significantly in females receiving neoadjuvant CRT as regards secondary endpoints of general health, emotional well-being, and social functions. Adjuvant chemotherapy has no significant effect on QOL in males or females.

The weakness of this study is caused by missing surveys: the fact that patients with a stoma cannot answer the questionnaire resulted in a relatively small number of patients. Further, large prospective studies are needed to clearly define the morbidity and thus allow an accurate discussion with the patients when obtaining informed consent for treatment.

Conclusions

Neoadjuvant CRT is the main risk factor for bowel dysfunctions and bad QOL in all the study items.

No significant differences in the domain-specific scores between the laparoscopic and open colorectal resections.

Recommendation

As this study was a retrospective one, we are planning to extend the work to be a prospective study and introduce objective comparative investigations such as bowel transit time and anorectal manometry with clear comparison between preoperative and postoperative results, which was not possible with this retrospective study.

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Nil.

Conflicts of interest

Conflict of interest is colorectal surgery.

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