Al-Azhar International Medical Journal

Volume 5 | Issue 7 Article 48

7-31-2024
Section: General Surgery

To Prepare or Not to Prepare the Bowel before Elective Colorectal Surgery

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How to Cite This Article

Khoder, Bahaa Eldin Safwat; Lasheen, Adel Mohamed Abdelhaleem; and Abdelaty, Waleed Raafat (2024) "To Prepare or Not to Prepare the Bowel before Elective Colorectal Surgery," *Al-Azhar International Medical Journal*: Vol. 5: Iss. 7, Article 48.
DOI: https://doi.org/10.58675/2682-339X.2566

ORIGINAL ARTICLE

To Prepare or Not to Prepare the Bowel before Elective Colorectal Surgery

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Abstract

Background: ***Preoperative bowel preparation is used to reduce the complication rate following elective colorectal surgery. However, the necessity and optimal method of bowel preparation remain a controversial issue.***

Aim of the work: ***To evaluate the effectiveness of bowel preparation in elective colorectal surgery to determine if it is necessary or not.***

Patients and methods: ***Eighty patients undergoing elective colorectal surgery were divided into four equal groups to evaluate the difference among various forms of bowel preparation (mechanical, chemical, combined, and no preparation) regarding the postoperative complication rate and the length of hospital stay.***

Results: ***There were no statistically significant differences among the study groups regarding the postoperative complication rate and the length of hospital stay.***

Conclusion: ***Provided that improved surgical techniques and perioperative care are ensured, the routine use of bowel preparation before elective colorectal surgery can be safely discontinued.***

Keywords: Bowel; Preparation; Elective; Colorectal; Surgery

1. Introduction

Colorectal surgery is a distinctive circumstance in which the organ of surgery is profoundly laden with a huge number of bacteria that may reach a concentration of 10^{12} per gram of faeces, forming almost 50% of the mass of the contained stool.[1] This heavy bacterial load was blamed for the elevated rates of postoperative surgical site infection and postoperative mortality (80-90% and 30%, respectively) documented after primary colorectal resections performed in the early 20th century.[2,3] Therefore, later colorectal surgeons were motivated to invent a preoperative preparatory technique that diminishes the bacterial concentration within the bowel before surgery, aiming to reduce these elevated postoperative rates to a reasonable level. This technique was the preoperative bowel preparation.[3] Bowel preparation lowers the bacterial concentration either by colorectal washout (mechanical preparation), oral antibiotics (chemical preparation) or both (combined preparation) .[4,5] From that time on, bowel preparation has become a routine policy before elective colorectal surgery.[5] However, necessity and the optimal method of bowel preparation remain a controversial issue where practice differs from country to country and from a colorectal surgeon to another, even among those working in the same medical facility, owing to a lack of standardization and generally approved guidelines and recommendations.[5,6]

The current study aims to evaluate the effectiveness of bowel preparation in elective colorectal surgery and determine whether it is necessary or not.

2. Patients and methods

This is a prospective randomized study that included 80 patients who underwent elective colorectal surgery at Sohag Cancer Center between December 2021 and September 2023. These patients were distributed into four equal groups. Group 1 patients received a combined (mechanical and chemical) preparation. Group 2 patients received a mechanical bowel preparation only. Group 3 patients received chemical bowel preparation only. Group 4 patients received no bowel preparation at all..

Accepted 21 July 2024.
Available online 31 July 2024

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Selected patients were subjected to detailed history taking, meticulous physical examination, and complete laboratory/radiological investigations to identify the status of the current surgical disease and discover any associated co-morbidity. Patients were admitted to the hospital two days before surgery.

Patients planned for bowel preparation were allowed to take only a clear liquid non-residue diet for two days before surgery, while those planned for no preparation were allowed to take a low-residue diet. Mechanical bowel preparation was given to groups 1 and 2 one day before surgery in the form of 2-4 litres of a Polyethylene Glycol solution (2 sachets of Polyethylene Glycol dissolved in 4 litres of water) taken orally in divided doses. Chemical bowel preparation was given to groups 1 and 3 as a combination of Neomycin (500 mg tds) and Metronidazole (500 mg tds) for two days before surgery. Patients were adequately hydrated, and their vital signs were monitored.

All groups of patients were instructed to evacuate their bowels early in the morning of the day of surgery and were given a prophylactic parenteral antibiotic in the form of intravenous Cefotaxime 500mg at the induction of anaesthesia. In addition, prophylactic anticoagulant therapy was commenced.

During surgery, the patients were adequately hydrated, and the intestine was carefully handled. Intestinal anastomoses were performed as a single layer of interrupted sutures. All patients had peritoneal drains inserted and a diverting ileostomy constructed.

Postoperatively, all patients received prophylactic parenteral antibiotic therapy (Cefotaxime and Metronidazole), and gradual oral feeding was initiated when bowel function had been regained without leakage. Peritoneal drains were then removed once their discharge had become negligible.

All patients were followed up for two months after surgery to evaluate recovery and detect any postoperative complications.

3. Results

Eighty patients were equally distributed into 4 groups: Group 1 (combined preparation), group 2 (mechanical preparation), group 3 (chemical preparation) and group 4 (no preparation).

Table 1. Comparison among groups regarding age and gender distribution.

		GROUP 1	GROUP 2	GROUP 3	GROUP 4	TEST-VALUE	P-VALUE	SIG.
		No.=20	No.=20	No.=20	No.=20			
AGE (YEARS)	Mean ± SD	57.75 ± 10.27	60.65 ± 6.37	61.15 ± 6.88	60.35 ± 7.25	0.751•	0.525	NS
	Range	28–72	47–71	46–73	42–74			
GENDER	Female	4(20%)	5(25%)	4(20%)	6(30%)	0.759*	0.859	NS
	Male	16(80%)	15(75%)	16(80%)	14(70%)			

P-value >0.05: Non-significant (NS); P-value <0.05: Significant (S); P-value< 0.01: highly significant (HS).

*:Chi-square test; •: One Way ANOVA test.

Regarding age and gender distribution, there was no difference of statistical significance among different groups of the current study (Table 1).

Table 2. Comparison among groups regarding surgical disease distribution.

SURGICAL DISEASE	GROUP 1	GROUP 2	GROUP 3	GROUP 4	TEST-VALUE*	P-VALUE	SIG.
	No.=20	No.=20	No.=20	No.=20			
SIGMOID CANCER	7(35%)	6(30%)	5(25%)	6(30%)	3.876*	0.986	NS
CAECAL CANCER	2(10%)	0(0%)	1(5%)	1(5%)			
RECTAL CANCER	6(30%)	8(40%)	7(35%)	7(35%)			
ASCENDING COLON CANCER	3(15%)	2(10%)	3(15%)	2(10%)			
DESCENDING COLON CANCER	2(10%)	4(20%)	4(20%)	4(20%)			

P-value >0.05: Non-significant (NS); P-value <0.05: Significant (S); P-value< 0.01: highly significant (HS).

*:Chi-square test.

Regarding the distribution of the underlying colorectal surgical diseases, there was no difference of statistical significance among different groups of the current study (Table 2).

Table 3. Comparison among groups regarding conducted operations.

OPERATION	GROUP 1	GROUP 2	GROUP 3	GROUP 4	TEST-VALUE	P-VALUE	SIG.
	No.=20	No.=20	No.=20	No.=20			
SIGMOIDECTOMY	7(35%)	6(30%)	5(25%)	6(30%)	4.676*	0.968	NS
RIGHT HEMICOLECTOMY	4(20%)	2(10%)	2(10%)	2(10%)			
ANTERIOR RESECTION	6(30%)	8(40%)	7(35%)	7(35%)			
EXTENDED RIGHT HEMICOLECTOMY	1(5%)	0(0%)	2(10%)	1(5%)			
LEFT HEMICOLECTOMY	2(10%)	4(20%)	4(20%)	4(20%)			

P-value >0.05: Non-significant (NS); P-value <0.05: Significant (S); P-value< 0.01: highly significant (HS).

*:Chi-square test.

Regarding the distribution of the conducted operations, there was no difference of statistical

significance among different groups of the current study (Table 3).

Table 4. Comparison among groups regarding associated co-morbidities.

		GROUP 1	GROUP 2	GROUP 3	GROUP 4	TEST-VALUE*	P-VALUE	SIG.
		No.=20	No.=20	No.=20	No.=20			
TOTAL CO-MORBIDITY	No	7(35%)	8(40%)	8(40%)	9(45%)	0.417	0.937	NS
	Yes	13(65%)	12(60%)	12(60%)	11(55%)			
HYPERTENSION	No	12(60%)	13(65%)	12(60%)	13(65%)	0.213	0.975	NS
	Yes	8(40%)	7(35%)	8(40%)	7(35%)			
DIABETES MELLITUS	No	14(70%)	15(75%)	16(80%)	15(75%)	0.533	0.912	NS
	Yes	6(30%)	5(25%)	4(20%)	5(25%)			
CARDIAC	No	18(90%)	19(95%)	19(95%)	19(95%)	0.640	0.887	NS
	Yes	2(10%)	1(5%)	1(5%)	1(5%)			
RESPIRATORY	No	19(95%)	18(90%)	20(100%)	19(95%)	2.105	0.551	NS
	Yes	1(5%)	2(10%)	0(0%)	1(5%)			
RENAL	No	20(100%)	19(95%)	19(95%)	19(95%)	1.039	0.792	NS
	Yes	0(0%)	1(5%)	1(5%)	1(5%)			

P-value >0.05: Non-significant (NS); P-value <0.05: Significant (S); P-value< 0.01: highly significant (HS).

*:Chi-square test.

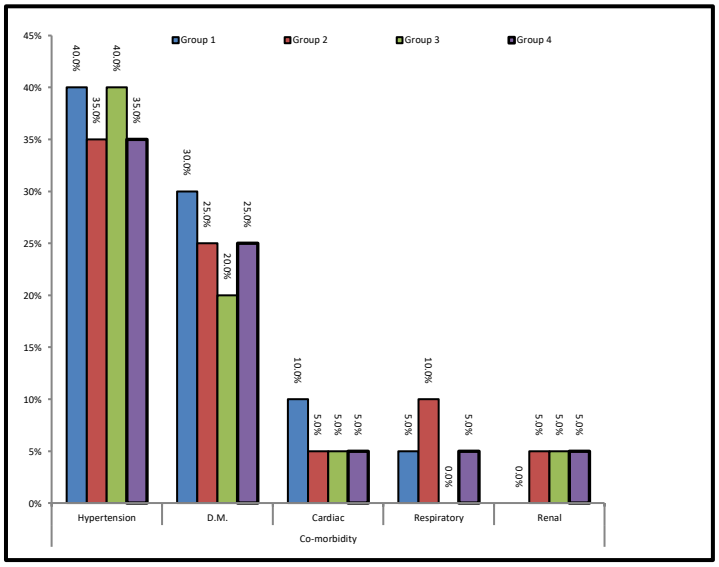

Figure 1. Comparison among groups regarding associated co-morbidities.

D.M.: Diabetes Mellitus.

Regarding the distribution of the associated co-morbidities, there was no difference of statistical significance among different groups of the current study. The most frequent associated co-morbidities were hypertension and diabetes mellitus (Table 4 and Figure 1).

Table 5. Comparison among groups regarding the postoperative complications.

		GROUP 1	GROUP 2	GROUP 3	GROUP 4	TEST-VALUE*	P-VALUE	SIG.
		No.=20	No.=20	No.=20	No.=20			
TOTAL COMPLICATIONS	No	11(55%)	9(45%)	10(50%)	7(35%)	1.760	0.624	NS
	Yes	9(45%)	11(55%)	10(50%)	13(65%)			
CHEST INFECTION	No	18(90%)	18(90%)	19(95%)	18(90%)	0.470	0.926	NS
	Yes	2(10%)	2(10%)	1(5%)	2(10%)			
ILEUS	No	17(85%)	16(80%)	16(80%)	15(75%)	0.625	0.891	NS
	Yes	3(15%)	4(20%)	4(20%)	5(25%)			
WOUND INFECTION	No	18(90%)	16(80%)	17(85%)	15(75%)	1.732	0.630	NS
	Yes	2(10%)	4(20%)	3(15%)	5(25%)			
COLLECTION & LEAK	No	16(80%)	16(80%)	17(85%)	15(75%)	0.625	0.891	NS
	Yes	4(20%)	4(20%)	3(15%)	5(25%)			
URINARY TRACT INFECTION	No	19(95%)	19(95%)	20(100%)	19 (95%)	1.039	0.792	NS
	Yes	1(5%)	1(5%)	0(0%)	1 (5%)			

P-value >0.05: Non-significant (NS); P-value <0.05: Significant (S); P-value< 0.01: highly significant (HS).

*:Chi-square test.

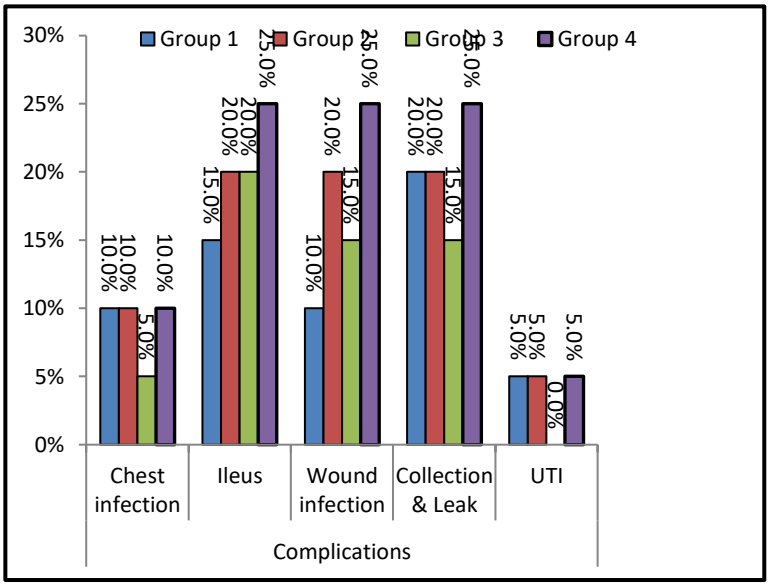

Figure 2. Comparison among groups regarding the postoperative complications.
U.T.I.: Urinary Tract Infection.

Regarding the postoperative complications, there was no difference of statistical significance among different groups of the current study (Table 5 and Figure 2).

Table 6. Comparison among groups regarding the length of hospital stay (in days).

HOSPITAL STAY	GROUP 1	GROUP 2	GROUP 3	GROUP 4	TEST-VALUE	P-VALUE	SIG.
	No.=20	No.=20	No.=20	No.=20			
MEAN ± SD	14.85± 8.09	18.30±9.38	16.8 ± 8.26	19.00 ± 9.12	0.886•	0.452	NS
RANGE	8–35	8–38	9–35	8–37			

P-value >0.05: Non-significant (NS); P-value <0.05: Significant (S); P-value< 0.01: highly significant (HS).

•: One Way ANOVA test.

Regarding mean values of the length of hospital stay, there was no difference of statistical significance among different groups of the current study (Table 6).

4. Discussion

Preoperative bowel preparation is of two kinds: mechanical and chemical. Mechanical preparation is usually done as a rapid process that is conducted on the day before surgery via repeated flushing of the intestine with an oral lavage solution. It is a time-consuming intervention that is usually unpleasant to the patient. It may cause nausea, vomiting, colic or exhaustion.[7,8] It may also cause fluid and electrolyte disturbances, particularly in old patients and in those suffering from renal or cardiopulmonary diseases.[9] In addition, mechanical preparation may directly cause histopathological changes in the intestinal wall as well as a disturbance to the colonic beneficial microflora leading to colonic mucosal damage secondary to an excessively decreased synthesis of short-chain fatty acids within the colon. These changes may predispose to bacterial translocation, and anastomotic disruption.[10,11] Although mechanical preparation is said to reduce bacterial concentration within the colon via irrigation of the bowel and elimination of the contained stool, it fails, in the absence of oral antibiotics to reduce the bacterial concentration adherent to the colon mucosa and within its surface mucous layer.[11] Moreover, mechanical preparation may cause a prolonged postoperative ileus, facilitate intraoperative leakage and contamination due to its role in stool liquefaction and impair healing of the intestinal anastomoses.[8,9,12] All these adverse effects of mechanical preparation may result in a prolonged period of hospital stay. Furthermore, inadequate mechanical bowel preparation may render surgery more technically difficult.[9] Mechanical bowel preparation is contraindicated in many cases, such as intestinal obstruction, gastrointestinal perforation, paralytic ileus, toxic megacolon, severe colitis, gastric paresis/retention and diverticulitis.[13] On the other hand, chemical bowel preparation reduces bacterial concentration via the effect of oral antibiotic combinations. Like mechanical preparation, chemical preparation has adverse effects, e.g., side effects of antibiotics, allergy, idiosyncrasy, development of antibiotic resistance, and increased risk for Clostridium difficile colitis.[14,15]

Numerous studies related to the use of preoperative bowel preparation in elective colorectal surgery are available in the medical literature. However, the results and recommendations of these studies are usually

conflicting, making bowel preparation a very controversial issue.

The current study included eighty patients with colorectal cancer who were subjected to elective colorectal surgery. They were 61 males (76%) and 19 females (24%). Patients were randomly distributed into the four study groups. Gender prevalence and mean age values experienced in the study matched those reported in the literature for colorectal cancer.[16,17] Regarding the underlying cancer, most patients (66 cases, 83%)were suffering from cancers of the distal large intestine, particularly the rectosigmoid region (52 cases, 65%), which is compatible with the site prevalence of colorectal cancers.[4,16] Consequently, anterior resection was the most frequently performed operation (28 cases, 35%), followed by sigmoidectomy (24 cases, 30%). As regards the associated co-morbidities, hypertension and diabetes were the most frequently recorded co-morbidities (38% and 25%, respectively), which is expected for the age range of the patients contributing to the study. Differences among the study groups regarding gender, age, underlying cancer, performed operations and associated co-morbidities did not reach a statistically significant level.

Patients were followed up for two months postoperatively to evaluate the efficacy of the different forms of bowel preparation regarding the postoperative complications and the length of hospital stay. There were no statistically significant differences among the four study groups regarding these variables.

The results of the current study suggest that bowel preparation has no conferred advantage to the patient over no preparation in elective colorectal surgery.

4. Conclusion

Provided that improved surgical techniques and perioperative care are ensured, the routine use of bowel preparation before elective colorectal surgery can be safely discontinued.

Disclosure

The authors have no financial interest to declare in relation to the content of this article.

Authorship

All authors have a substantial contribution to the article

Funding

No Funds : Yes

Conflicts of interest

There are no conflicts of interest.

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