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Does mechanical bowel preparation really prevent complications after colorectal surgery depending on the lesion localization? A myth or fact?

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ABSTRACT

Objective: Despite being routinely used before elective colorectal surgery in most surgical clinics, mechanical bowel preparation (MBP) remains controversial. This study aimed to investigate postoperative complications and outcomes of right, left, or rectosigmoid resection without MBP.

Material and Methods: Patients who underwent elective colorectal surgery without mechanical bowel preparation and oral antibiotics between January 2011 and December 2021 were included in the study. Patients were categorized according to the side of resection, and these subgroups were compared for anastomotic leakage, surgical site infections (SSI), and overall morbidity measured using the Clavien-Dindo complication grade.

Results: Data of 422 patients were analyzed. Overall anastomotic leakage was found in 14 patients (3.3%), SSI in 46 (10.9%), collection in 14 (3.3%), mortality in 18 (4.3%), and reoperation in 17 (%4) patients. Anastomotic leakage was observed in six (3.9%) in right colectomy, two (1.9%) in left colectomy, and in six (3.7%) patients in the rectosigmoid resection group when the groups were evaluated separately. There was no statistical difference between the groups (p= 0.630). Furthermore, there was no statistical difference between the groups regarding collection and reoperation (p values were p= 0.31, and p= 0.251, respectively).

Conclusion: Study results showed that anastomotic leakage, surgical site infection, intra-abdominal collection, reoperation, and mortality rates were similar to the current literature obtained from the studies with mechanical bowel preparation. In addition, these results were found to be similar according to the resection site.

Keywords: Preoperative bowel preparation, mechanical bowel preparation, infectious complications, surgical site infection, anastomotic leakage

INTRODUCTION

Colorectal surgeons use various protocols for bowel preparation to prevent complications such as anastomotic leakage, intraabdominal abscess, and surgical site infections. These include oral antibiotics, intravenous antibiotics, rectal enemas, oral solutions, and combinations.

Despite having been used for nearly a century to reduce postoperative infectious complications and minimize the contamination of the operation area by reducing the colonic bacterial load (1,2), the usage of mechanical bowel preparation (MBP) is still questionable and the debate of the usage has been not to be finalized yet. Based on evidence-based studies, three different aspects are formed in clinical practice. Studies conducted in recent years have shown that complications such as anastomotic leakage, surgical site infection (SSI), and intraabdominal abscess are less common in patients with mechanical bowel preparation (3-6). On the other hand, some studies have shown that MBP does not affect postoperative infectious complications and anastomotic leakage rates (7-9). Other studies have paradoxically cited increased rates of infectious complications after MBP and also slower return of bowel function and increased rates of cardiac complications, electrolyte disturbances, and anastomotic leak (10-12).

The first questioning of the necessity and effectiveness of MBP was shown in a study by Hughes in 1972 (13). After this study, many studies have emerged exploring the potential benefits of MBP. However, various studies have shown that the

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reduction or prevention of SSI, intraabdominal abscess, and anastomotic leakage cannot be prevented after MBP (14,15). Furthermore, MBP is not recommended before colorectal surgery as it causes various side effects such as bloating, nausea, fatigue, electrolyte imbalance, abdominal discomfort, and perforation, especially in elderly patients (16,17).

The World Health Organization (WHO) and American Society of Colon and Rectal Surgeons (ASCRS) guidelines recommend oral antibiotics (OA) together with MBP (18,19). On the other hand, the Enhanced Recovery After Surgery (ERAS) guidelines in elective colorectal surgery assigned the low quality of evidence for MBP with OAs (20). Therefore, the ERAS guidelines still recommend that MBP should not be routinely used in colon surgery. Therefore, this study investigated the postoperative morbidity of resections in different colon regions in patients who had undergone elective colorectal surgery without MBP retrospectively.

The aim of this study was to investigate complications in patients who underwent colonic resection and anastomosis without performing MBP and comparing the outcomes of right, left or rectosigmoid resections with each other. The primary aim was to evaluate anastomotic leakage and surgical site infection in addition to the rate of SSI within 30 days after surgery and subcategories of SSI (superficial incisional, deep incisional, and organ/space. Secondary aim was to evaluate overall morbidity measured by using Clavien-Dindo complication grade.

MATERIAL and METHODS

Source of Data and Study Population

We conducted a retrospective single-center cohort study of patients from tertiary centers experienced in colorectal surgery. These patients underwent elective colorectal resections for benign and malignant diseases for ten years from January 2011 to December 2021. The ethics committee approved the study protocol of the university hospital (E-78017789-050.01.04-1647269/2021/347). A total of 767 consecutive patients were enrolled in this study. Exclusion criteria were accepted as follows: 1) patients who underwent emergent surgery (n= 87), 2) age under 18 years (n= 2), 3) patients with bowel obstruction (n= 14), 4) patients who underwent abdominoperineal resection with end stoma (n= 24), patients who performed laparoscopic surgery (n= 184) and 6) patients with no enough data available in the medical records (n= 34). Finally, four hundred and twenty-two patients who fulfilled the eligibility criteria were included in the study.

Patients were divided into three groups according to lesion localization and resection site. Of these, regions from the ileocolic region to the 2/3 proximal of the transverse colon were included in the right colectomy group; resections from the 1/3 distal part of the transverse colon to the distal sigmoid colon were included in the left colectomy group, and resections from the distal sigmoid colon to the distal rectum were included in the rectosigmoid resection group.

Prophylactic intravenous antibiotic prophylaxis was routinely administered with 1500 mg of cefuroxime and 500 mg of metronidazole 30 minutes before the incision and was terminated on day one postoperatively. It was also repeated when the operation time exceeded four hours, and blood loss exceeded 1.5 liters. In addition, ciprofloxacin 500 mg was administered to patients with penicillin and cephalosporin allergy.

Demographic data (age, sex), ASA scores, transfusion needing, receiving neoadjuvant treatment, comorbidity status (Charlson Comorbity Index), operation indication (malignant causes, benign causes), type of operation, protective ileotomy status and stage of the disease were recorded. In terms of postoperative results, anastomotic leakage, intraabdominal collection, mortality, reoperation and extraintestinal infection were recorded.

The primary and secondary aims of the study are stated in the manuscript. The primary aim was to evaluate the anastomotic leakage and surgical site infection. In addition, the rate of SSI within 30 days after surgery and subcategories of SSI (superficial incisional, deep incisional, and organ/space), as defined by the Centers for Disease Control and Prevention (21). Secondary outcomes included overall morbidity measured using the Clavien-Dindo complication grade (22).

Statistical Methods

Descriptive findings were presented as numbers and percentages for categorical variables and as mean and standart deviation for continuous variables. The Kolmogorov-Smirnov test evaluated the conformity of continuous variables to normal distribution. In the comparisons of groups of three or more, those with normal distribution were analyzed with the ANOVA test, and those which did not show normal distribution were analyzed with the Kruskal Wallis test. Tukey equal variances for those who show equal variances when comparing binary groups and Tamhane's T2 post-hoc test was applied in those who did not. Pearson's chi-square test was used to compare categorical variables in independent groups. The exact test was applied in cases that did not meet the Pearson's chi-square test conditions. Multivariable logistic regression analysis was performed to evaluate the relationship between colon regions and complications with further analysis. The results were evaluated with a 95% confidence interval, with an alpha error of 0.05. Statistical analysis was performed using the Statistical Package for Social Sciences (SPSS) for Windows 25.0 (IBM SPSS Inc., Chicago, IL).

RESULTS

A total of 422 consecutive patients with a mean age of 59.9 ± 13.7 (range, 18-92) years were included in our study.

Male/Female ratio was 239 (56.6%)/183 (43.4%). A total of 252 (59.7%) patients were under 65 years, whereas 170 (40.3%) of the patients were 65 years or over. ASA score was I (+43.4%) or II (56.6%) in most of the patients. The Charlson comorbidity index score of the patients was similar in all groups, and the average was 3. Neoadjuvant treatment was applied in 39 (9.2%) the patients. The need for peri/post-operative blood transfusions was seen in 193 (45.7%) patients, while 229 (54.3%) patients did not need any transfusion. Three hundred and sixty-five (86.5%) patients were operated for malignant reasons, and the remaining 57 (13.5%) of the patients were operated for benign reasons.

In the form of reconstruction after resection, colorectal anastomosis was performed in 234 (55.5%) patients, ileocolic anastomosis in 147 (34.8%) patients, and colocolic anastomosis in 41 (9.7%) patients. Protective ileostomy was applied to 108 (25.6%) patients. Clinicopathological and demografic features of the patients were summarized in Table 1.

Table 1. Clinicopathological and demographic features of the patients

	Right colon	Left colon	Rectosigmoid	p
Age	62.99 ± 13.03	56.18 ± 15.44	59.66 ± 12.50	<0.001
Sex				0.648
Female	70 (46.1)	46 (43.4)	67 (40.9)	
Male	82 (53.9)	60 (56.6)	97 (59.1)	
ASA				<0.001
ASA 1	25 (16.4)	28 (26.4)	62 (37.8)	
ASA 2	92 (60.5)	62 (58.5)	85 (51.8)	
ASA 3	29 (19.1)	15 (14.2)	15 (9.1)	
ASA 4	6 (3.9)	1 (0.9)	2 (1.2)	
Transfusion				0.593
No	85 (55.9)	53 (50)	91 (55.5)	
Yes	6 (.1)	53 (50)	73 (44.5)	
Comorbidity				0.129
No	71 (46.7)	55 (51.9)	65 (39.6)	
Yes	81 (53.3)	51 (48.1)	99 (60.4)	
Malignancy				<0.001
Benign	17 (11.2)	35 (33)	5 (3)	
Malignant	135 (88.8)	71 (67)	159 (97)	
Operation type				<0.001
Ileocolic anastomosis	144 (94.7)	2 (1.9)	1 (0.6)	
Colocolic anastomosis	0 (0)	41 (38.7)	0 (0)	
Colorectal anastomosis	8 (5.3)	63 (59.4)	163 (99.4)	
Stoma status				<0.001
No stoma	143 (94.1)	84 (79.2)	87 (53)	
Protective ileostomy	9 (5.9)	22 (20.8)	77 (47)	
Stage				0.084
Stage 1	12 (10)	8 (13.8)	26 (17.1)	
Stage 2	36 (30)	15 (25.9)	24 (15.8)	
Stage 3	60 (50)	26 (44.8)	86 (56.6)	
Stage 4	12 (10)	9 (15.5)	16 (10.5)	
NACRT				<0.001
No	150 (98.7)	106 (100)	127 (77.4)	
Yes	2 (1.3)	0 (0)	37 (22.6)	

ASA: American Society of Anesthesiologists, NACRT: Neoadjuvant chemoradiotherapy.

When the three groups were evaluated in terms of mean age, it was seen that the mean age of the right colon patients was 62.99 ± 13.03, the left colon patients were 56.18 ± 15.44, and the rectum patients were 59.66 ± 12.50 years, and a statistically significant difference was determined (p< 0.001). In group comparisons, it was determined that the group that created a statistically significant difference was the mean age of the right and left colon (p< 0.001).

Postoperative complication rates of the patients were analyzed according to the Clavien-Dindo complication grade and when all groups were evaluated, major complication (3b and above) was seen in 35 (8%) patients. Anastomotic leakage was observed in 14 (3.3%), intra-abdominal collection in 14 (3.3%), reoperation in 17 (4%), wound infection in 46 (10.9%), extraintestinal infection in 65 (15.4%), and mortality in 18 (4.3%) patients. Postoperative infective complications of the patients according to lesion localization are summarized in Table 2.

The patients were divided into three groups according to lesion localization and the resections performed: right colectomy group consisted of 152 (36.02%) patients, whereas left colectomy group included 106 (25.12%) patients, and rectosigmoid resection group had 164 (38.86%) of the patients. Anastomotic leakage was observed in six (3.9%) patients in the right colectomy group, two (1.9%) patients in the left colectomy group, and seven (4.3%) patients in the rectosigmoid resection group. Intraabdominal collection rates were seen in six (3.9%) patients in the right colectomy, one (0.9%) in the left colectomy, and in seven (4.3%) patients in the rectosigmoid resection group. No statistically significant results were found between the three groups (p= 0.31) in terms of intraabdominal collections. Reoperation was seen in nine (5.9%), two (1.9%), four (2.4%) patients in the right colectomy, left colectomy, and rectosigmoid resection groups, respectively. Wound infection was seen in 15 (9.9%), 10 (9.4%) and 21 (12.8%) patients in the right colectomy, left colectomy, and rectosigmoid resection groups, respectively. Extraintestinal infection was seen in 23 (15.1%), 11 (10.4%) and 31 (18.9%) patients in the right colectomy, left colectomy, and rectosigmoid resection groups, respectively. Mortality was observed in 13 (8.6%), one (0.9%), four (2.4%) patients in the right colectomy, left colectomy, and rectosigmoid resection groups, respectively. There was no statistically significant difference between the groups regarding anastomotic leakage, intraabdominal collection, reoperation, wound infection, extraintestinal infection, and p values were 0.093, 0.31, 0.251, 0.612, and 0.234, respectively. Considering the mortality rates, it was found to be higher in the right colectomy group compared to the other groups, and the p value was 0.003. In addition, multivariable logistic regression analysis of the clinicopathological data of the patients according to the lesion localization is shown in Table 3.

Table 2. Postoperative complications of the patients according to lesion localization

	Right colon	Left colon	Rectosigmoid	p
Anastomotic leakage				0.630
No	146 (96.1)	104 (98.1)	158 (96.3)	
Yes	6 (3.9)	2 (1.9)	6 (3.7)	
Collection				0.310
No	146 (96.1)	105 (99.1)	157 (95.7)	
Yes	6 (3.9)	1 (0.9)	7 (4.3)	
Mortality				0.003
No	139 (91.4)	105 (99.1)	160 (97.6)	
Yes	13 (8.6)	1 (0.9)	4 (2.4)	
Reoperation				0.251
No	143 (94.1)	104 (98.1)	158 (96.3)	
Yes	9 (5.9)	2 (1.9)	6 (3.7)	
SSI				0.612
No	137 (90.1)	96 (90.6)	143 (87.2)	
Yes	15 (9.9)	10 (9.4)	21 (12.8)	
Extra intestinal infection				0.234
No	129 (84.9)	95 (89.6)	133 (81.1)	
Yes	23 (15.1)	11 (10.4)	31 (18.9)	

SSI: Surgical site infection.

Table 3. Multivariable logistic regression analysis of the clinicopathological data of the patients according to the lesion localization

		B	Std. Error	Wald	p	OR	95% confidence interval for OR	
							Lower bound	Upper bound
Right colon	Intercept	0.082	1.789	0.002	0.964			
	Age	0.008	0.013	0.408	0.523	1.011	0.98	1.03
	Charlson comorbidity index	-0.084	0.069	1.49	0.222	0.92	0.80	1.05
	Albumin	-0.599	0.208	8.338	0.004	0.55	0.37	0.83
	ASA 1	-1.522	0.963	2.496	0.114	0.22	0.03	1.44
	ASA 2	-0.385	0.926	0.173	0.678	0.68	0.11	4.18
	ASA 3	-0.496	0.965	0.264	0.607	0.61	0.09	4.04
	ASA 4 (ref)							
	Benign (ref: malignant)	1.8	0.585	9.473	0.002	6.05	1.92	19.04
	NAKRT No (ref: yes)	1.453	0.829	3.072	0.08	4.28	0.84	21.71
	Alive (ref: ex)	-0.811	0.669	1.47	0.225	0.44	0.12	1.65
Left colon	Intercept	-17.035	2.066	68.013	0			
	Age	-0.015	0.013	1.419	0.234	0.99	0.96	1.01
	Charlson comorbidity index	0.011	0.07	0.023	0.879	1.01	0.88	1.16
	Albumin	-0.415	0.223	3.459	0.063	0.66	0.43	1.02
	ASA 1	-0.689	1.29	0.286	0.593	0.50	0.04	6.28
	ASA 2	0.352	1.261	0.078	0.78	1.42	0.12	16.84
	ASA 3	0.447	1.302	0.118	0.731	1.56	0.12	20.06
	ASA 4 (ref)							
	Bening (ref: malignant)	2.832	0.555	26.076	<0.001	16.9	5.73	50.37
	NACRT No (ref: yes)	-	-	-	-	-	-	-
	Alive (ref: ex)	1.405	1.171	1.44	0.23	4.08	0.41	40.49

The reference category is: Rectosigmoid.
ASA: American Society of Anesthesiologists, NACRT: Neoadjuvant chemoradiotherapy.

When multivariable logistic regression analysis of the colon regions and complications was performed, anastomotic leakage among the patients who underwent rectosigmoid resection (p= 0.196, OR= 0.28, 95% CI for OR= 0.04-1.94) was found when the right colon was taken as a reference. For SSI (p= 0.219, OR= 0.59, 95% CI for OR= 0.25-1.37), complication status (p= 0.054, OR= 0.59, 95% CI for OR= 0.25-1.37), and collection (p= 0.521, OR= 0.57, 95% CI for OR= 0.25-1.37), no statistical difference was observed. In addition, anastomotic leakage (p= 0.462, OR= 0.41, 95% CI for OR= 0.04-4.36) and SSI (p= 0.493, OR= 0.71, 95% CI for OR= 0.27-1.87) compared to the left colon region, again when the right colon is referenced (0.27-1.87), and complication status (p= 0.183, OR= 0.13, 95% CI for OR= 0.01-2.59) and collection (p= 0.559, OR= 2.14, 95% CI for OR= 0.17-27.36) showed no difference. These findings are shown in Table 4.

DISCUSSION

The present study evaluated postoperative outcomes in patients who underwent elective colorectal surgery without mechanical bowel preparation. The role of mechanical bowel preparation in colorectal surgery is still controversial. The negative effect on infection rates, the lack of effectiveness of mechanical preparation, and its use have led to a decrease (23). In line with the evidence of randomized trials and meta-analyses conducted in recent years, it has been understood that mechanical bowel preparation has no benefit on postoperative results (24,25).

While SSI is 11.4% in colorectal surgery, it varies between 5.4% and 23.2% (26). In the European results, depending on the ERAS protocol, SSI rates of >10% have been observed in patients who did not undergo mechanical bowel preparation (27). In the MOBILE trial investigating mechanical and oral antibiotic bowel preparation (MOABP) versus no bowel preparation (NBP) in the right and left colectomy, subgroup analysis has shown that the rate of SSI in patients who underwent right colectomy was similar in the MOABP and NBP groups, 7% and 10%, 9%, respectively (OR= 0.71, 95% CI= 0.26-1.95; p= 0.510). In addition, SSI has been found at a similar rate in the MOABP and NBP groups who underwent left colectomy and were 6% and 10%, respec-

Table 4. Multivariable logistic regression analysis of the colon regions and complications

		B	Std. Error	Wald	p	OR	95% confidence interval for OR	
							Lower bound	Upper bound
Rectosigmoid	Intercept	-1.896	1.227	2.387	0.122			
	Anastomotic leak (ref: yes)	-1.278	0.989	1.668	0.196	0.28	0.04	1.94
	Collection (ref: yes)	-0.568	0.885	0.413	0.521	0.57	0.10	3.21
	Alive (ref: ex)	3.459	1.313	6.947	**0.008**	31.80	2.43	416.49
	Reoperation (ref: yes)	3.392	1.512	5.034	**0.025**	29.74	1.54	575.87
	SSI (ref: yes)	-0.533	0.434	1.508	0.219	0.59	0.25	1.37
	Minor complication (ref: major complication)	-2.521	1.31	3.705	0.054	0.08	0.01	1.05
Left colon	Intercept	-4.492	2.016	4.963	0.026			
	Anastomotic leak (ref: yes)	-0.884	1.203	0.54	0.462	0.41	0.04	4.36
	Collection (ref: yes)	0.759	1.301	0.341	0.559	2.14	0.17	27.36
	Alive (ref: ex)	3.914	1.772	4.878	0.027	50.11	1.55	1616.11
	Reoperation (ref: yes)	2.759	1.792	2.37	0.124	15.79	0.47	529.75
	SSI (ref: yes)	-0.336	0.491	0.47	0.493	0.71	0.27	1.87
	Minor complication (ref: major complication)	-2.022	1.517	1.777	0.183	0.13	0.01	2.59

The reference category is: Right colon. SSI: Surgical site infection.

tively (OR= 0.57, 95% CI= 0.18-1.82; p= 0.338) (28). The SSI rates in the current study were 10.9%. When we evaluated it as a subgroup, the rates of 9.9%, 9.4%, and 12.8% were observed in those who underwent right colectomy, left colectomy, and rectosigmoid resections, respectively.

Anastomotic leakage is among the most important causes of mortality after colorectal surgery. Anastomotic leakage rates reported in colorectal surgery vary between 1.8% and 19% (29). The present study also evaluated the effect of NBP on anastomotic leakage. In a study evaluating patients with and without MBP, anastomotic leakage rates were 2.3% and 2.6%, respectively; and there was no statistical difference (30). In addition, similar results are supported by other studies (31,32). As demonstrated in a prospective randomized trial, there was no difference in anastomotic leakage between MBP and NBP among 249 patients who underwent rectal surgery. Anastomotic leakage rates were 4.2% and 2.3%, respectively (33). In our study, the rate of anastomotic leakage was 2.8%. In subgroup analysis, it was found as 3.9% in right colon surgery, 1.9% in left colon surgery, and 3.7% in patients with rectosigmoid surgery.

In a meta-analysis evaluating the effect of mechanical bowel preparation on postoperative outcomes in elective colorectal surgery, when MBP was compared with no MBP, there was no difference in the incidence of anastomotic leak (OR = 0.90, 95% CI= 0.74 to 1.10, p= 0.32) also in terms of SSI. When the studies were evaluated, no difference existed between those who underwent MBP and those who did not. Also, intraabdominal collection (OR = 0.86, 95% CI= 0.63 to 1.17, p= 0.34), reoperation (OR= 0.91, 95% CI= 0.75 to 1.12, p= 0.38) and mortality (OR= 0.50, 95% CI= 0.34 to 0.74, p= 0.0005) rates were evaluated in this meta-analysis, and effectiveness of MBP was observed on it (34). In our study, similar to this meta-analysis, when we performed and evaluation according to the resection sites of the colon, the rates of intraabdominal collection (p= 0.31) and reoperation (p= 0.251) were similar, but mortality rates (p= 0.003) were not different from the patients who underwent MBP, unlike this meta-analysis.

When the studies conducted in recent years are evaluated, there is disperancy in meta-analyses on mechanical bowel preparation, oral antibiotic use and IV antibiotic use before elective colorectal surgery. In a meta-analysis involving 5107 patients in 10 randomized controlled trials, patients have been grouped as IV antibiotics only, MBP with IV antibiotics, IV and oral antibiotics and MBP with oral antibiotics. Although there was no difference in terms of anastomotic leakage; SSI was seen to be reduced by more than 50% in patients who did not undergo MBP (35). In another meta-analysis, the analysis included a total of 22 studies involving 8852 patients. Patients were divided into two groups as MBP alone and MBP with oral antibiotics. As a result, the incidence of AL was significantly lower in the group treated with MBP plus OAB compared with MBP alone (OR= 0.43, 95% CI= 0.23-0.81, p= 0.009, I2= 73%). In addition, SSI was significantly lower in the MBP plus oral antibiotics group (OR= 0.38, 95% CI= 0.32-0.46, p< 0.0001, I2= 24%) (36).

The effect of gut microbiota composition on postoperative infectious complications after colorectal surgery has been demonstrated (37). When MBP is combined with oral antibiotics, both the microbiome and pathobionts are affected. MBP with oral antibiotics causes the disruption of the delicate balance between pathogen proliferation and natural suppression by rearrangement of the normal microbiota (38). In addition, the importance of the gut microbiota in its influence on gut sensorimotor function, which is associated with postoperative recovery of gut function, has been demonstrated in recent animal studies (39).

Although this study had several limitations, it also included some powerful features. The first significant limitation was the retrospective and single-center design. Although many studies evaluate the effectiveness of MBP, a vital aspect of the study was that the first study evaluated the outcomes of right and left hemicolectomy and anterior resection without MBP and compared them. Another strength of this study might be the large sample size. In addition, some patients need neoadjuvant chemotherapy, which is expected to increase postoperative complications. Nevertheless, the results of this study showed that using neoadjuvant chemotherapy might not increase postoperative infective complications under the condition of non-mechanical bowel preparations.

CONCLUSION

Surgical site infections are in an Achilles heel condition after colorectal surgery. Within the framework of the ERAS protocols, mechanical and oral antibiotic bowel preparations have been abandoned for decades. However, the rate of anastomotic leakage, one of the most feared complications after colorectal surgery, has not changed. Contrary to dogma and popular belief, data from patients who did not undergo mechanical bowel preparation were analyzed and discussed with the current literature in this study. Surgical site infection, postoperative mortality, intraabdominal collection rates, and anastomotic leakage were similar.

Ethics Committee Approval: This study was approved by Mersin University Rectorate Clinical Research Ethics Committee (Decision no: IEC/GMC/Cat C/2021/448, Date: 13.02.2021).

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REFERENCES

1. *Halsted WS. Circular suture of the intestine: An experimental study. Am J Med Sci 1887; 94: 436-61. https://doi.org/10.1097/00000441-188710000-00010*
2. *Thornton FJ, Barbul A. Healing in the gastrointestinal tract. Surg Clin North Am 1997; 77: 549-73. https://doi.org/10.1016/S0039-6109(05)70568-5*
3. *Vo E, Massarweh NN, Chai CY, Cao HST, Zamani N, Abraham S, et al. Association of the addition of oral antibiotics to mechanical bowel preparation for left colon and rectal cancer resections with reduction of surgical site infections. JAMA Surg 2018; 153(2): 114-21. https://doi.org/10.1001/jamasurg.2017.3827*
4. *Koller SE, Bauer KW, Egleston BL, Smith R, Philp MM, Ross HM, et al. Comparative effectiveness and risks of bowel preparation before elective colorectal surgery. Ann Surg 2018; 267(4): 734-42. https://doi.org/10.1097/SLA.0000000000002159*
5. *Morris MS, Graham LA, Chu DI, Cannon JA, Hawn MT. Oral antibiotic bowel preparation significantly reduces surgical site infection rates and readmission rates in elective colorectal surgery. Ann Surg 2015; 261(6): 1034-40. https://doi.org/10.1097/SLA.0000000000001125*
6. *Contant CM, Hop WC, van't Sant HP, Smeets HJ, Stassen LPS, Neijenhuis PA, et al. Mechanical bowel preparation for elective colorectal surgery: A multicentre randomised trial. Lancet 2007; 370(9605): 2112-7. https://doi.org/10.1016/S0140-6736(07)61905-9*
7. *Jung B, Påhlman L, Nyström PO, Nilsson E; Mechanical Bowel Preparation Study Group. Multicentre randomized clinical trial of mechanical bowel preparation in elective colonic resection. Br J Surg 2007; 94(6): 689-95. https://doi.org/10.1002/bjs.5816*
8. *Bucher P, Gervaz P, Soravia C, Mermillod B, Erne M, Morel P. Randomized clinical trial of mechanical bowel preparation versus no preparation before elective left-sided colorectal surgery. Br J Surg 2005; 92(4): 409-14. https://doi.org/10.1002/bjs.4900*
9. *Eskicioglu C, Forbes SS, Fenech DS, Mcleod RS; Best Practice in General Surgery Committee. Preoperative bowel preparation for patients undergoing elective colorectal surgery: A clinical practice guideline endorsed by the Canadian Society of Colon and Rectal Surgeons. Can J Surg 2010; 53(6): 385-95.*
10. *Gravante G, Caruso R, Andreani SM, Giordano P. Mechanical bowel preparation for colorectal surgery: A meta-analysis on abdominal and systemic complications on almost 5,000 patients. Int J Colorectal Dis 2008; 23(12): 1145-50. https://doi.org/10.1007/s00384-008-0592-z*
11. *Beloosesky Y, Grinblat J, Weiss A, Grosman B, Gafter U, Chagnac A. Electrolyte disorders following oral sodium phosphate administration for bowel cleansing in elderly patients. Arch Intern Med 2003; 163(7): 803-8. https://doi.org/10.1001/archinte.163.7.803*
12. *Slim K, Vicaut E, Launay-Savary MV, Contant C, Chipponi J. Updated systematic review and meta-analysis of randomized clinical trials on the role of mechanical bowel preparation before colorectal surgery. Ann Surg 2009; 249(2): 203-9. https://doi.org/10.1097/SLA.0b013e318193425a*
13. *Hughes ES. Asepsis in large-bowel surgery. Ann R Coll Surg Engl 1972; 51(6): 347-56.*
14. *Cao F, Li J, Li F. Mechanical bowel preparation for elective colorectal surgery: Updated systematic review and meta-analysis. Int J Colorectal Dis 2012; 27(6): 803-10. https://doi.org/10.1007/s00384-011-1361-y*

15. *Frontali A, Panis Y. Bowel preparation in colorectal surgery: Back to the future? Updates Surg 2019; 71(2): 205-7. https://doi.org/10.1007/s13304-019-00663-y*
16. *Kim IY. Role of Mechanical bowel preparation for elective colorectal surgery. Korean J Gastroenterol 2020; 75(2): 79-85. https://doi.org/10.4166/kjg.2020.75.2.79*
17. *Perry WB. Is mechanical bowel preparation mandatory for elective colon surgery? A prospective randomized study: Commentary. Dis Colon Rectum 2007; 50: 129-30.*
18. *World Health Organization (2018). WHO Guidelines Approved by the Guidelines Review Committee. World Health Organization, Global Guidelines for the Prevention of Surgical Site Infection. Geneva.*
19. *Migaly J, Baford AC, Francone TD, Gaertner WB, Eskicioglu C, Bordeianou L, et al. (2019) The American Society of Colon and Rectal Surgeons clinical practice guidelines for the use of bowel preparation in elective colon and rectal surgery. Dis Colon Rectum 2019 Jan; 62(1): 3-8. https://doi.org/10.1097/DCR.0000000000001238*
20. *Gustafsson UO, Scott MJ, Hubner M, Nygren J, Demartines N, Francis N, et al. (2019) Guidelines for perioperative care in elective colorectal surgery: Enhanced Recovery After Surgery (ERAS®) Society recommendations: 2018. World J Surg 2019; 43(3): 659-95. https://doi.org/10.1007/s00268-018-4844-y*
21. *National Healthcare Safety Network, Centers for Disease Control and Prevention. Surgical site infection (SSI) event. 2021. Available from: https://www.cdc.gov/nhsn/pdfs/pscmanual/9pscssicurrent.pdf (Accessed date: 25.01.2021).*
22. *Dindo D, Demartines N, Clavien PA. Classification of surgical complications: A new proposal with evaluation in a cohort of 6336 patients and results of a survey. Ann Surg 2004; 240(2): 205-13. https://doi.org/10.1097/01.sla.0000133083.54934.ae*
23. *Badia JM, Arroyo-García N. Mechanical bowel preparation and oral antibiotic prophylaxis in colorectal surgery: Analysis of evidence and narrative review. Cir Esp (Engl Ed) 2018; 96(6): 317-25. https://doi.org/10.1016/j.ciresp.2018.03.009*
24. *Fry DE. Colon preparation and surgical site infection. Am J Surg 2011; 202(2): 225-32. https://doi.org/10.1016/j.amjsurg.2010.08.038*
25. *Güenaga KF, Matos D, Wille-Jørgensen P. Mechanical bowel preparation for elective colorectal surgery. Cochrane Database Syst Rev 2011; 2011(9): CD001544. https://doi.org/10.1002/14651858.CD001544.pub4*
26. *Young H, Knepper B, Moore EE, Johnson JL, Mehler P, Price CS. Surgical site infection after colon surgery: National Healthcare Safety Network risk factors and modeled rates compared with published risk factors and rates. J Am Coll Surg 2012; 214(5): 852-9. https://doi.org/10.1016/j.jamcollsurg.2012.01.041*
27. *ERAS Compliance Group. The impact of enhanced recovery protocol compliance on elective colorectal cancer resection: Results from an international registry. Ann Surg 2015; 261(6): 1153-9. https://doi.org/10.1097/SLA.0000000000001029*
28. *Koskenvuo L, Lehtonen T, Koskensalo S, Rasilainen S, Klintrup K, Ehrlich A, et al. Mechanical and oral antibiotic bowel preparation versus no bowel preparation in right and left colectomy: Subgroup analysis of MOBILE trial. BJS Open 2021; 5(2): zrab011. https://doi.org/10.1093/bjsopen/zrab011*
29. *Henrik Iversen, Madelene Ahlberg, Marja Lindqvist, Buchli C. Changes in clinical practice reduce the rate of anastomotic leakage after colorectal resections. World J Surg 2018; 42(7): 2234-41. https://doi.org/10.1007/s00268-017-4423-7*
30. *Jung B, Påhlman L, Nyström PO, Nilsson E; Mechanical Bowel Preparation Study Group. Multicentre randomized clinical trial of mechanical bowel preparation in elective colonic resection. Br J Surg 2007; 94(6): 689-95. https://doi.org/10.1002/bjs.5816*
31. *Van't Sant HP, Weidema WF, Hop WC, Oostvogel HJM, Contant CME. The influence of mechanical bowel preparation in elective lower colorectal surgery. Ann Surg 2010; 251(1): 59-63. https://doi.org/10.1097/SLA.0b013e3181c0e75c*
32. *der AM, Steele CW, Conn D, Mackay GJ, McMillan DC, Horgan PG, et al. Effect of preoperative oral antibiotics in combination with mechanical bowel preparation on inflammatory response and short-term outcomes following left-sided colonic and rectal resections. BJS Open 2019; 3(6): 830-39. https://doi.org/10.1002/bjs5.50224*
33. *Zmora O, Mahajna A, Bar-Zakai B, Shabtai M, Krausz MM, Ayalon A. Is mechanical bowel preparation mandatory for left-sided colonic anastomosis? Results of a prospective randomized trial. Tech Coloproctol 2006; 10(2): 131-5. https://doi.org/10.1007/s10151-006-0266-1*
34. *Rollins KE, Javanmard-Emamghissi H, Lobo DN. Impact of mechanical bowel preparation in elective colorectal surgery: A meta-analysis. World J Gastroenterol 2018; 24(4): 519-36. https://doi.org/10.3748/wjg.v24.i4.519*
35. *Woodfield JC, Clifford K, Schmidt B, Thompson-Fawcett M. Has network meta-analysis resolved the controversies related to bowel preparation in elective colorectal surgery? Colorectal Dis 2022; 24(10): 1117-27. https://doi.org/10.1111/codi.16194*
36. *Yue Y, Chen X, Wang H, Cheng M, Zheng B. Mechanical bowel preparation combined with oral antibiotics reduces infectious complications and anastomotic leak in elective colorectal surgery: A pooled-analysis with trial sequential analysis. Int J Colorectal Dis 2023; 38(1): 5. https://doi.org/10.1007/s00384-022-04302-8*
37. *Lederer AK, Pisarski P, Kousoulas L, Fichtner-Feigl S, Hess C, Huber R. Postoperative changes of the microbiome: Are surgical complications related to the gut flora? A systematic review. BMC Surg 2017; 17(1): 125. https://doi.org/10.1186/s12893-017-0325-8*
38. *Alverdy JC, Shogan BD. Preparing the bowel for surgery: Rethinking the strategy. Nat Rev Gastroenterol Hepatol 2019; 16(12): 708-9. https://doi.org/10.1038/s41575-019-0214-y*
39. *Barbara G, Stanghellini V, Brandi G, Cremon C, Di Nardo G, De Giorgio R, et al. Interactions between commensal bacteria and gut sensorimotor function in health and disease. Am J Gastroenterol 2005; 100(11): 2560-8. https://doi.org/10.1111/j.1572-0241.2005.00230.x*

ORİJİNAL ÇALIŞMA-ÖZET
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Mekanik bağırsak hazırlığı lezyon lokalizasyonuna bağlı olarak kolorektal cerrahi sonrası komplikasyonları gerçekten önler mi? Bir efsane mi, gerçek mi?

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ÖZET

Giriş ve Amaç: Mekanik bağırsak hazırlığının (MBP) cerrahi kliniklerin çoğunda elektif kolorektal cerrahiden önce rutin olarak kullanılmasına rağmen, MBP kullanımı tartışmalıdır. Bu çalışma, MBP yapılmadan sağ, sol veya rektosigmoid rezeksiyonların postoperatif komplikasyonlarını ve sonuçlarını araştırmayı amaçladı.

Gereç ve Yöntem: Ocak 2011 ile Aralık 2021 tarihleri arasında mekanik bağırsak hazırlığı yapılmadan elektif kolorektal cerrahi uygulanan hastalar çalışmaya dahil edildi. Hastalar rezeksiyon tarafına göre kategorize edildi ve bu alt gruplar, Clavien-Dindo sınıflaması kullanılarak ölçülen anastomoz kaçağı ve cerrahi alan enfeksiyonları (CAE) ve genel morbidite açısından karşılaştırıldı.

Bulgular: Dört yüz yirmi iki hastanın verileri retrospektif olarak analiz edildi. Toplam anastomoz kaçağı 14 (%3,3), cerrahi alan enfeksiyonu 46 (%10,9), batın içi koleksiyon 14 (%3,3), mortalite 18 (%4,3), reoperasyon 17 (%4) hastada saptandı. Gruplar ayrı ayrı değerlendirildiğinde sağ kolektomide altı (%3,9), sol kolektomide iki (%1,9) ve rektosigmoid rezeksiyon grubunda altı (%3,7) hastada anastomoz kaçağı görüldü. Gruplar arasında istatistiksel fark yoktu (p= 0,630). Ayrıca toplama ve tekrar operasyon açısından gruplar arasında istatistiksel fark yoktu; p değerleri sırasıyla p= 0,31 ve p= 0,251 idi.

Sonuç: Çalışmanın sonuçları; anastomoz kaçağı, cerrahi alan enfeksiyonu, karın içi sıvı toplanması, tekrar operasyon ve ölüm oranlarının mekanik bağırsak hazırlığıyla yapılan çalışmalardan elde edilen mevcut literatürle benzer olduğunu gösterdi. Ayrıca bu sonuçlar rezeksiyon bölgesine göre benzer bulunmuştur.

Anahtar Kelimeler: Preoperatif bağırsak hazırlığı, mekanik bağırsak hazırlığı, enfeksiyöz komplikasyonlar, cerrahi alan enfeksiyonu, anastomoz kaçağı

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