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A study on efficacy of mechanical bowel preparation in case of elective colorectal surgery

Madhusudan Panja[1], Chandranath Banerjee[2], Riddhisundar Samanta[3], Amalesh Barman[4]

[1]Medical Officer, [3]Senior Resident, [4]Associate Professor, Department of General Surgery, Tamralipto Government Medical College, Purba Medinipur, [2]Associate Professor, Department of General Surgery, Burdwan Medical College, Burdwan, West Bengal, India

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ABSTRACT

Background: There has been a resurgence of interest in the use of mechanical bowel preparation (MBP) and antibiotics before elective colorectal surgery. In the era of antibiotics, the use of MBP is controversial. **Aims and Objectives:** The aim of the current study was to analyze the effect of MBP over "no MBP" on outcome in patients undergoing elective colorectal surgery. **Materials and Methods:** This study was an institution-based prospective, randomized and comparative study. Fifty patients, who were planned for elective colorectal surgery between February 2018 and July 2019 in Department of General Surgery, were included in this study. The patients were divided into two groups. Group 1: Surgeries with use of MBP; Group 2: Surgeries without use of MBP. Outcomes of surgeries were analyzed in terms of post-operative anastomotic leak, intra-abdominal septic collections, wound infections, hospital stay, return of IPS, and start of enteral feeding. **Results:** This study demonstrates that risk of anastomotic leak, wound infection, intra-abdominal collection, and hospital stay were higher among MBP group over non-MBP group and also better outcomes in non-MBP groups in respect to early return of IPS, early oral feeding. **Conclusion:** Our study proves that no advantage is gained by preoperative MBP in elective colorectal surgery and can be easily avoided to save patients from unwanted exhaustion, distress, and adverse effects related to it.

Key words: Anastomotic leak; Colorectal surgery; Early recovery after surgery; Mechanical bowel preparation

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INTRODUCTION

Mechanical bowel preparation (MBP) is traditionally done before elective colorectal surgery. Therefore, it was thought that risk of fecal contamination or infection of peritoneal cavity and abdominal wound decreases.[2] Surgical resection is the cornerstone of treatment for the patients with colorectal cancer followed by primary anastomosis is pursued in uncomplicated colorectal resections. The most serious complication of colorectal surgery with restoration of bowel continuity is anastomotic leakage. In this modern era, preoperative assessment, perioperative care, surgical techniques, use of antibiotics, and concepts of multimodality treatment have led to a marked decrease in morbidity and mortality. However, MBP has some disadvantages also. Hence, controversy has come whether MBP is useful or not. It was seen that MBP liquefies the solid feces, which could increase the risk of intraoperative spillage of the bowel contaminant, and hence, contamination.[3] It had been shown by various authors that although MBP does cause reduction in the fecal mass in the colon, it does not cause any significant reduction in the concentration per millimeter of the bacterial count in the lumen of the colon in the absence of prophylactic antibiotics.Thus, on its own MBP has no beneficial value.[4] Besides this, MBP has many negative side effects, like discomfort to patients and water and electrolyte imbalance,[1] and is also not safe for elderly

Address for Correspondence:
Dr. Amalesh Barman, Associate Professor, Department of General Surgery, Tamralipto Government Medical College, Purba Medinipur, West Bengal, India. **Mobile:** +91-9434146426. **E-mail:** dr.a.barman72@gmail.com

patients and those having underlying cardiac, renal and pulmonary disease.[5] There was also significant loss of epithelial cells, edema of lamina propria, and lymphocytic and polymorph nuclear cell infiltration in these patients. These changes could potentially result in the bacterial translocation and anastomotic disruption.[6] Avoidance of MBP is one of the components of early recovery after surgery (ERAS). Despite these drawbacks, MBP is still practiced by most of the colorectal surgeons worldwide in elective colorectal surgery without evidence from randomized trials.[7] Hence, the rationale of this research is to assess whether elective colon and rectal surgery can be safely performed without MBP and thus reducing patient discomfort, length of hospital stay, treatment cost, and overall better outcome.

Aims and objectives

The present study was planned to assess whether elective colon and rectal surgery may be safely performed without bowel preparation, and to compare the outcomes of post-operative complications between preparation and non-preparation group and to determine the effectiveness and risk of prophylactic mechanical bowel preparation regarding mortality and morbidity of colorectal surgery.

MATERIALS AND METHODS

It is an institution-based prospective, randomized, and comparative study from February 2018 to July 2019 in Burdwan Medical College and Hospital, a tertiary care hospital (a semi urban region of Eastern India).

Study population

Patient admitted in the department of general surgery emergency and outpatient department (OPD).

Sample size

50 patients.

Parameters noted

- Age and sex distribution of the patient undergoing operative intervention
- Patients are operated with or without MBP
- Intra-abdominal collection
- Anastomotic leakage
- Wound infection
- Hospital stay
- Return of IPS
- Start of enteral feeding.

Inclusion criteria

- Both sexes
- Any age group excluding pediatric age group.

Exclusion criteria

- The patient who underwent colonoscopy within 7 days from surgery
- Patients refused informed consent
- Renal failure (serum creatinine more than 3 mg/dL)
- Patients having preoperative comorbidities such as diabetes, asthma, chronic obstructive pulmonary disease, immunodeficiency, and coagulopathy
- Pregnant and lactating women
- Patients with obstructive features (emergency procedure).

Study tools

- OPD tickets
- Indoor bed head tickets
- History and clinical examination note
- Consent form
- Operation theater records
- Investigation report.

After proper ethical approval fifty patients who fulfill all the above inclusion criteria and none of the exclusion criteria have been chosen randomly, and in this study, demographic characteristics, pathological condition, and type of surgical procedure did not significantly differ between the two groups. The procedure is conducted by the following way-in this systematic prospective hospital-based randomized controlled study, patients were distributed into two groups: Group-1 preparation group; and Group-2 a group without preparation. An informed consent was taken from all the patients included in the study. Randomization was done with the help of random number table by assigning serial number to all colorectal cancer patients and with the help of the said table these colorectal cancer patients were distributed blindly into two groups; patients who got odd numbers were kept in a preparation group and the patients who got even numbers were allotted to non-preparation group. The patients in the preparation group received oral MBP by using two packs of polyethylene glycol in two liters of water over 12–16 h before elective surgery. Vital parameters like blood pressure, pulse rate, hydration status and electrolytes both before and after preparation were monitored, and if any deficit was found it were corrected accordingly. They were allowed to take only liquid diet until midnight, the evening before surgery; on the other hand, low residue diet was allowed until midnight the evening before surgery in patients with no preparation. All patients received premedication of tablet diazepam 10 mg orally the night before surgery as per pre-anesthetic check-up direction to allay anxiety, apprehension and for sound sleep. patients also received tablet ranitidine 150 mg in the previous night with sips of water. All patients in both group in their peri-operative period received broad-spectrum intravenous antibiotics at the time of induction before the start of

procedure (ceftriaxone injection 1 g and Metronidazole injection 500 mg) and was continued postoperatively also for another 72 h. The operating surgeon was completely blinded about the preparation status of the patients in order to eliminate bias in preparation.

Outcomes of surgery were studied clinically, radiologically. Complications with reference to anastomotic leak, intra-abdominal septic collections, wound infections; return of IPS, initiation of enteral feeding and hospital stay specifically post-operative hospital stays in days was recorded. Wound infection was defined as a wound requiring partial or complete opening for drainage of collection. Anastomotic leak was identified if fecal drainage was evident from abdominal drains or documented by imaging modalities. Abdominal/pelvic collection was defined as a collection demonstrated by ultrasonography or computed tomography scan in conjunction with elevated temperature or total leukocyte count.

RESULTS

Statistical analysis was performed with the help of EPI INFO™ 7.2.2.2. EPI INFO is a trademark of the Centers for Disease Control and Prevention. Descriptive statistical analysis was performed to calculate the means with corresponding standard deviations (SD). Test of proportion was used to find the Standard Normal Deviate (Z) to compare the difference proportions and Chi-square test was performed to find the associations. A value of $P<0.05$ was considered statistically significant.

There was no significant difference in the mean age of the patients of two groups. Thus, the patients of two groups were matched for their ages.

There was no significant association between gender and the patients of two groups. Thus, the patients of two groups were matched for their gender.

There was no significant association between surgery performed and the patients among the two groups. Thus, the patients of two groups were comparable for surgery required to treat them.

Anastomotic leakages were more or less equally distributed over the patients of the two groups ($P=0.63$). However, this table demonstrated that MBP has chance more post-operative anastomotic leakage over no MBP (odds ratio −1.56).

Intra-abdominal collections were more or less equally distributed over the patients of the two groups. However, the risk of intra-abdominal collections was 1.56 times more among the patients for whom mechanical preparation was done as compared to the patients for whom mechanical preparation was not done, but the risk was not statistically significant (odds ratio −1.56).

This table shows risk of post-operative wound infection is more common in patients undergone MBP (Odds ratio 1.31), although it is not statistically significant.

This table shows that in the patients who undergone colorectal surgery without MBP, return of IPS occurred earlier in comparison to those with MBP ($P=0.0295$).

In 72% of the patients who undergone colorectal surgery without MBP, enteral feeding can be initiated within 1 week. In the patients with MBP, only 36% can tolerate oral feeding within 7 days. This table shows that it is better to avoid MBP in colorectal surgery.

This table demonstrated that the patients without MBP had statistically significant lesser hospital stay in comparison to those with MBP.

DISCUSSION

Colorectal malignancy is gradually increasing worldwide due to the lack of a national screening program. Therefore, surgery of colorectal cancer is getting more frequent. Hence, different groups of colorectal surgeons are doing modifications related to its management. Screening colonoscopy can diagnose colorectal cancers in the early stage. MBP is a standard protocol before colonoscopy. But controversy is still going on with the use of MBP before elective colorectal surgery. In our study, demographic characteristics, pathological condition, and type of surgical procedure did not significantly differ between the two groups (Tables 1-3). Guenaga KF study[8] did not show any differences in anastomotic leakage between patients of two groups (MBP vs. Non-MBP). In their study, mortality and length of stay were also similar as in these two groups, but those differed in our study. In our study, there was no death but risk of anastomotic leak, wound infection, intra-abdominal collection was higher among MBP group but the risk was not significant (Tables 4-6). Anastomotic leakage and risk of intra-abdominal collection was 1.56 times more among the patients for whom mechanical preparation was done but the risk was not statistically significant ($P=0.63$). The risk of wound infection was 1.31 times more among the patients for whom mechanical preparation was done but the risk was not significant ($P=0.71$). There was significant difference in terms of return of IPS and duration of time required for enteral feeding and duration of hospital

Table 1: Distribution of the study population according to different age groups

Age (years)	MBP done (%)	MBP not done (%)	Total (%)
25–39	11 (44.0)	8 (32.0)	19
40–54	8 (32.0)	9 (36.0)	17
55–69	5 (20.0)	6 (24.0)	11
≥70	1 (4.0)	2 (8.0)	3
Total	25 (100.0)	25 (100.0)	50 (100.0)
Mean ± SD	44.88±14.20	46.16±12.26	

Chi-square statistics: 0.9568, *P*=0.811715. MBP: Mechanical bowel preparation, SD: Standard deviation

Table 2: Distribution of the study population according to gender

Gender	MBP done (%)	MBP not done (%)	Total (%)
Male	14 (56.0)	16 (64.0)	30 (60.0)
Female	11 (44.0)	9 (36.0)	20 (40.0)
Total	25 (100.0)	25 (100.0)	50 (100.0)

Chi-square statistics: 0.3333, P=0.563703. MBP: Mechanical bowel preparation

Table 3: Distribution of the study population according to different colorectal surgery performed in the two groups

Surgery required	MBP done (%)	MBP not done (%)	Total (%)
Abdominal mesh rectopexy	4 (16.0)	2 (8.0)	6 (12.0)
Extended right hemicolectomy	3 (12.0)	5 (20.0)	8 (16.0)
Left hemicolectomy	7 (28.0)	8 (32.0)	15 (30.0)
Low anterior resection	1 (7.2)	4 (16.0)	5 (10)
Right hemicolectomy	10 (40.0)	6 (24.0)	16 (32.0)
Total	25 (100.0)	25 (100.0)	50 (100.0)

Chi-square statistics: 4.0333, P=0.401513. MBP: Mechanical bowel preparation

Table 4: Distribution of the study population according to post-operative anastomotic leakage among two groups

Anastomotic leakage	MBP done (%)	MBP not done (%)	Total (%)
Yes	3 (12.0)	2 (8.0)	5 (10.0)
No	22 (88.0)	23 (92.0)	45 (90.0)
Total	25 (100.0)	25 (100.0)	50 (100.0)

Chi-square statistics: 0.2222, P=0.637352. MBP: Mechanical bowel preparation

Table 5: Distribution of the study population according to intra-abdominal collections

Intra-abdominal collections	MBP done (%)	MBP not done (%)	Total (%)
Yes	3 (12.0)	2 (8.0)	5 (10.0)
No	22 (88.0)	23 (92.0)	45 (90.0)
Total	25 (100.0)	25 (100.0)	50

Chi-square statistics: 0.2222, P=0.637352. MBP: Mechanical bowel preparation

Table 6: Distribution of the study population according to post-operative wound infection

Wound infection	MBP done (%)	MBP not done (%)	Total (%)
Yes	5 (20.0)	4 (16.0)	9 (18.0)
No	20 (80.0)	21 (84.0)	41 (82.0)
Total	25 (100.0)	25 (100.0)	50

Chi-square statistics: 1.355, P=0.712795. MBP: Mechanical bowel preparation

Table 7: Distribution of the study population according to return to IPS

Time required to return to IPS (days)	MBP done (%)	MBP not done (%)	Total (%)
2–4	7 (28.0)	16 (64.0)	23 (46.0)
5–7	16 (64.0)	7 (28.0)	23 46.0)
>7	2 (8.0)	2 (8.0)	4 (8.0)
Total	25 (100.0)	25 (100.0)	50 (100.0)
Mean ± SD	5.88±2.09	4.08±1.61	

Chi-square statistics: 7.0435, P=0.029548. MBP: Mechanical bowel preparation, SD: Standard deviation

Table 8: Distribution of the patients according to initiation of enteral feeding

Time required for enteral feeding (days)	MBP done (%)	MBP not done (%)	Total (%)
<7	9 (36.0)	18 (72.0)	27 (54.0)
7–14	13 (52.0)	5 (20.0)	18 (36.0)
>14	3 (12.0)	2 (8.0)	5 (10.0)
Total	25 (100.0)	25 (100.0)	50
Mean ± SD	8.88±5.37	6.16±3.87	

Chi-square statistics: 6.7556, P=0.034123. MBP: Mechanical bowel preparation, SD: Standard deviation

Table 9: Distribution of the patients according to duration of hospital stay

Duration of hospital stay (days)	MBP done (%)	MBP not done (%)	Total (%)
<7	1 (4.0)	11 (44.0)	12 (24.0)
7–14	20 (80.0)	12 (48.0)	32 (64.0)
>14	4 (16.0)	2 (8.0)	6 (12.0)
Total	25 (100.0)	25 (100.0)	50 (100.0)
Mean ± SD	12.88±9.48	9.16±7.12	

Chi-square statistics: 11.00, P=0.004087. MBP: Mechanical bowel preparation, SD: Standard deviation

stay between these two groups (Tables 7-9). Return of IPS among mechanical preparation group (5.88 days) which is significantly higher than the preparation was not done (4.08 days). Chi-square test showed that there was significant association time required to return IPS (P=0.029). Time required for enteral feeding among the MBP group (8.88 days) was significantly higher than the non MBP group (6.16 days). Chi-square test showed that there was significant association between time required for

enteral feedings (P=0.034). Chi-square test shows duration of hospital stay (MBP = 12.88 days versus Non MBP =9.16 days) was significant association between two groups (P=0.004). Oliveira L et al., in 2013 conducted a study regarding bowel preparation prior to elective colorectal surgery and suggested that MBP does not reduce surgical site infection in elective colorectal surgery. Saha et al., in 2014 and Kim et al.,[7] in 2014 suggested that the omission of MBP in elective colorectal surgery does not impair healing of colonic anastomosis, nor does it increase the risk of leakage.[9] For this reason, the practice with MBP has largely been discontinued in the different parts of the world. The result of our study suggested that in this modern era with the concept of ERAS, with improved perioperative care, surgical technique and availability of broad-spectrum antibiotic, elective colorectal surgery can be safely performed without bowel preparation, although preparation can be used in selective cases where intraoperative colonoscopy is necessary or where palpation of colon is important like in polypoid lesion.

Limitations of the study

The limitations of study was that the studied patients constituted a small sample therefore a large sample studies are warranted.

CONCLUSION

In the most comprehensive study of MBP in elective colorectal surgery to date, our study has recommended with adequate evidence that the use of MBP increases the incidence of postoperative complications when compared with no preparation. Hence, MBP should not be administered routinely prior to elective colorectal surgery.

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Work attributed to:
Burdwan Medical College and Hospital, West Bengal, India.

Orcid ID:
Dr. Amalesh Barman - https://orcid.org/0000-0001-6237-2676
Dr. Riddhisundar Samanta - https://orcid.org/0000-0002-4624-4233
Dr. Madhusudan Panja - https://orcid.org/0000-0002-3565-8115
Dr. Chandranath Banerjee - https://orcid.org/0009-0009-8677-4683

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