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Outcomes of anastomosis of mechanically prepared bowel vs. mechanically unprepared bowel in laparoscopic anterior resection in adult patients with rectal cancer

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ABSTRACT

Introduction: The limited literature supporting the utilization of mechanical bowel preparation (MBP) for patients undergoing laparoscopic anterior resection of rectum (LAR) remains a notable issue. This study was conducted to examine the clinical consequences of anastomosis in rectal surgery with MBP compared to cases where MBP is not utilized (no-MBP) in the context of LAR.

Methods: This is a retrospective comparative study conducted in the professorial surgical wards of Teaching Hospital Karapitiya (THK). Rectal cancer patients (n=306) participated in the study, including 151 MBP patients and 155 no-MBP patients where the postoperative complications and mortality rates were compared.

Results: The anastomotic leakage rate was 2.6% (n=4) in the no-MBP group and 6.0% (n=9) in the MBP group, (p=0.143). Postoperative paralytic ileus rate was 18.5% (n=28) and 5.8% (n=9) in the MBP group and no-MBP group respectively displaying a statistically significant difference (p=0.001). Wound infection, pneumonia, urinary tract infection, and cardiac complication rates also were higher in the MBP group. Overall mortality rate was 1.3% (n=3) in no-MBP group and 2.0% (n=2) in MBP group.

Conclusions: The evidence concludes that MBP increases post-operative complications. Therefore, prophylactic MBP in LAR has not been proven to benefit patients. However, further research is necessary to understand the comparative effects of MBP versus no preparation comprehensively.

Keywords: *Anastomosis, laparoscopic anterior resection, mechanical bowel preparation.*

Introduction

It is known that a considerable improvement in the survival of patients with rectal cancer occurred owing to early diagnosis of the condition, improved efficiency and delivery of chemotherapy and radiotherapy, and developments in surgical techniques. An anastomotic leakage (AL) can be defined as the breakdown of a colonic anastomosis associated with an intra-abdominal collection of colonic content diagnosed either by contrast radiography or at the time of relaparotomy by the surgeon (1). AL can be categorized as contained leaks and free leaks.

In general, contained leaks have been explained as localized collection bowel content, whereas free leaks have been explained as those with diffuse gross contamination of the peritoneal cavity.

Mechanical bowel preparation (MBP) is the process of cleaning the intestine of faecal matter and secretions. This procedure is normally undertaken prior to a diagnostic procedure or treatment being initiated for certain colorectal diseases. There are several effective cleansing preparations including, polyethylene glycol solution (*Colyte*), magnesium citrate with bisacodyl tablets, sodium phosphate solution (*Phospho-Soda*), and castor oil with bisacodyl tablets (2).

The preparation of the colon and rectum before surgery has many attractions. When considering some available literature, patients who had undergone MBP did not show any significant difference in AL rates, surgical site infection (SSI), intra-abdominal collection, mortality, re-operation, or hospital stay compared to patients who did not undergo MBP (3). The Enhanced Recovery After Surgery (ERAS) guidelines recommend systemic intravenous antibiotic usage prior to incision in all colonic surgery, but mechanical bowel preparation with systemic antibiotic prophylaxis alone has no clinical advantage and should not be used in colonic surgery (3). However, MBP can be considered in rectal surgery (3). The basis behind avoiding MBP in colonic surgery is to prevent preoperative dehydration, electrolyte imbalance, and discomfort to the patient, and in rectal surgery, MBP is done to clear stools of the colon prior to inserting a diverting stoma. Some studies including Toneva *et al.,* 2013 have specified that the combination of MBP and oral antibiotic preparation together with systemic antibiotics lowers the morbidity after colorectal surgery compared with MBP and systemic antibiotics alone which questioned the avoidance of MBP (4). The ERAS 2018 guideline also recommends the use of oral antibiotic prophylaxis with MBP rather than MBP alone.

Methods

A total of 306 patients with rectal cancer who underwent anterior resection of rectum between January 2015 to July 2022 in University surgical wards at Teaching Hospital Karapitiya, Sri Lanka (THK) were included in the study. Adult patients between the age of 40 - 70 years with all the necessary documents and records were selected while patients beyond this age category and patients in classes 3 and 4 of the American Society of Anesthesiologists Physical Status classification (ASAPS) were excluded from the study. (ASA 3: A patient with severe systemic disease. ASA 4: A patient with severe systemic disease that is a constant threat to life (5).

According to convenient sampling, 151 MBP patients and 155 patients without MBP (no-MBP) were chosen, and they were retrospectively analysed. All the cases were done laparoscopically. Conversion rate was 0. Data were obtained from the medical records including bed head tickets of the patients and theatre registries with prior consent from the Director of the hospital and all the consultants of the ward. As endpoints of the study, rates of complications between the 2 groups including anastomotic leak, postoperative paralytic ileus, wound infections, pneumonia, urinary tract infections, cardiovascular complications, and mortality rates were assessed. Leaks were detected radiologically by CECT abdomen and pelvis. Leaks with clinical significance were managed with temporary stoma. Ethical clearance for the study was obtained from the Ethics Review Committee of the Faculty of Medicine, University of Ruhuna.

Results

The study sample which consisted of 306 rectal cancer patients had 53.4% (n=165) males, while the rest of 45.6% (n=141) were females. The mean age ($\pm$SD) of the sample was 56.67 ($\pm$0.56) years. The mean weight and height of the sample were 60.36 ($\pm$0.72) kilograms and 159.14 ($\pm$0.65) centimeters respectively.

There were 151 (49.3%) of rectal cancer patients were on MBP group and 155 (50.7%) patients in no-MBP group. The rates of complications among the total sample are shown in Table 1 and Figure 1. The most common complication among the study sample was postoperative paralytic ileus (12.1%, n=37). Postoperative paralytic ileus after LAR among MBP and no-MBP groups showed a

statistically significant difference (p=0.001) with higher occurrence among MBP patients.

Anastomotic leak was the second commonest complication in the sample (n=13, 4.2%), while the majority occurred in patients who had MBP (n=9, 6%) (Table 1). Even though all the other complications were higher among the MBP group, they did not show a statistically significant difference from the no-MBP group.

The overall mortality rate was not statistically significant between the two groups. The mortality rate in patients who have undergone MBP is 2.0% (n=3) while it was 1.3% (n=2) in the no-MBP group.

Table 1: Post-operative complications among total study sample.

Complication	N	(%)
Anastomotic leak	13	(4.2)
Postoperative paralytic ileus	37	(12.1)
Wound infections	7	(2.3)
Pneumonia	11	(3.6)
Urinary Tract Infection	12	(3.9)
Cardiovascular complications	11	(3.6)

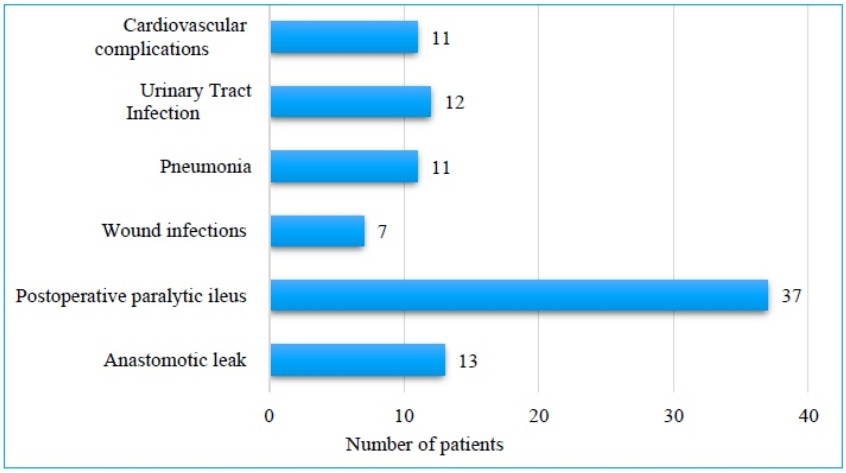

Figure 1: Post-operative complications among total study sample.

Table 2: Prevalence of each complication among MBP and no-MBP groups.

Variable	Complication	MBP group		No-MBP group		p value
		n	(%)	n	(%)	
Anastomotic leak (AL)	YES	9	(6.0)	4	(2.6)	0.143
	NO	142	(94.0)	151	(97.4)	
Postoperative paralytic ileus (PPI)	YES	28	(18.5)	9	(5.8)	0.001*
	NO	123	(81.5)	146	(94.2)	
Wound infections (WI)	YES	4	(2.6)	3	(1.9)	0.676
	NO	147	(97.4)	152	(98.1)	
Pneumonia (P)	YES	6	(4.0)	5	(3.2)	0.725
	NO	145	(96.0)	150	(96.8)	
Urinary Tract Infection (UTI)	YES	8	(5.3)	4	(2.6)	0.221
	NO	143	(94.7)	151	(97.4)	
Cardiovascular complications (CC)	YES	8	(5.3)	3	(1.8)	0.114
	NO	143	(94.7)	152	(98.1)	

* The χ^2 statistics – level of significance 0.05

Discussion

Butcher *et al.,* (2005), showed that left-sided colorectal surgery can be performed safely without MBP and argued that the bowel preparation may increase complication rates and longer hospital stays (6). However, Grabham, Moran and Lane (1995), were of the view that there is a potential danger in constructing a defunctioning stoma after colorectal surgery in an unprepared bowel and having faeces in contact with a newly performed anastomosis (7). Our comparative study results reflect that post-operative complications were higher in patients who have undergone LAR with mechanically prepared bowel. Among the postoperative complications which were assessed, postoperative paralytic ileus was the most common overall complications (12.1%). In this situation, its prevalence was higher in MBP patients (18.5%) than in no-MBP patients (5.8%) with statistically significant difference (p=0.001).

Systematic review and meta-analysis done by Leenen, Hentzen and Ockhuijsen (2019) have highlighted that there is no benefit of MBP in terms of decreasing colorectal anastomotic leakage (8). The results of our study showed similar findings with anastomotic leakage being higher in the MBP group (6.0%) than in the no-MBP group (2.6%).

Zmora *et al.,* (2005), in another study done on bowel preparation in laparoscopic colectomy compared and showed that infectious complications did not significantly vary between MBP and non-MBP patients after surgery (9). Post-operative wound infections in our study were more prevalent in MBP patients (2.6%) than in no-MBP patients (1.9%). Apart from this, pneumonia and urinary tract infections were also higher in the MBP group than in the no-MBP group. Though there is limited literature to compare cardiovascular complications among MBP patients and no-MBP patients, in our study it was found that cardiovascular complications were higher in the MBP (5.3%) than in no-MBP (1.8%).

When comparing with the available literature, a study done by van Geldere *et al.,* to assess complications after colorectal surgery without mechanical bowel preparation showed that the in-hospital mortality rate was 0.8% (95% CI : 0.1 - 2.9) and was not related to abdominal or septic complications (10). A randomised prospective trial done by Zmora *et al.,* (2005), showed that mortality occurred in three patients in each group (1.6%) in the prep group vs 1.55% in the no-prep group) (9). Even though a statistically significant difference was not seen in our comparative study, similarly the mortality rate was slightly higher in the MBP group (MBP-2.0% vs no-MBP - 1.3%).

Conclusions

In our study of laparoscopic anterior resection of adult patients with rectal cancer, the most common postoperative complication in both MBP patients and no-MBP patients was paralytic ileus. When all other complications studied were compared, there was an increase in number of complications in the MBP group than in the no-MBP group though the results were not statistically significant. Therefore, MBP has contributed to the increase in overall postoperative complications in this group of patients. Therefore, prophylactic MBP in anastomosis of LAR has not been proven to be worthy for the patients considered in this study. Further, the overall mortality rate was not significantly different between the two groups though the MBP group had a slightly higher mortality rate. Further studies are recommended for more conclusive results.

Limitations

The accuracy of the study results was impacted by the noncompliance of patients with bowel preparation protocols. Despite the fact that all procedures were performed by experienced surgeons, different surgeons use different surgical techniques during anastomosis in laparoscopic anterior resection. Because of these variations, surgical outcomes may have been influenced despite bowel preparation. Readmissions due to delayed complications following surgery were not considered during the study and that might be one of the reasons for the inability to generate statistically significant differences in some of the outcomes.

References

1. Damrauer S, Bordeianou L and Berger D. Contained Anastomotic Leak After Colorectal Surgery. *Archives of Surgery,* 2009; **144**(4): 333.
2. Bowel preparation [Internet]. Thefreedictionary.com. [cited 2022 Feb 24]. Available from: https://medical-dictionary.thefreedictionary.com/bowel+preparation
3. Gustafsson U, Scott M, Hubner M, *et al.* Guidelines for Perioperative Care in Elective Colorectal Surgery: Enhanced Recovery After Surgery (ERAS®) Society Recommendations: 2018. *World Journal of Surgery*. 2018; **43**(3): 659-695.
4. Toneva G, Deierhoi R, Morris, *et al.* Oral Antibiotic Bowel Preparation Reduces Length of Stay and Readmissions after Colorectal Surgery. *Journal of the American College of Surgeons,* 2013; **216**(4): 756-762.
5. Statement on ASA physical status classification system [Internet]. Asahq.org. [cited 2022 Feb 24]. Available from: https://www.asahq.org/standards-and-practice-parameters/statement-on-asa-physical-status-classification-system
6. Bucher P, Gervaz P, Soravia C, *et al.* Randomized clinical trial of mechanical bowel preparation versus no preparation before elective left-sided colorectal surgery. *Br J Surg.* 2005; **92**(4): 409-414.
7. Grabham J, Moran B and Lane R. Defunctioning colostomy for low anterior resection. A selective approach. *British Journal of Surgery*. 1995; **82**(10): 1331-1332.
8. Leenen JPL, Hentzen JEKR, Ockhuijsen HDL. Effectiveness of mechanical bowel preparation versus no preparation on anastomotic leakage in colorectal surgery: A systematic review and meta-analysis. *Updates Surgery,* 2019 Jun; **71**(2): 227-236.
9. Zmora O, Lebedyev A, Hoffman A, Khaikin M, Munz Y, Shabtai M, Ayalon A, and Rosin. Laparoscopic colectomy without mechanical bowel preparation. *International Journal of Colorectal Disease.* 2005; **21**(7): 683-687.
10. van Geldere D, Fa-Si-Oen P, Noach LA, *et al.* Complications after colorectal surgery without mechanical bowel preparation. *J Am Coll Surg.* 2002 Jan; **194**(1): 40-47.