

Mechanical Bowel Preparation in Preventing Wound Infection in Elective Colo-rectal Surgery: A Comparative Follow up

Ahmad MS

Abstract

Mechanical bowel preparation is routinely done before colorectal surgeries to reduce morbidity and mortality all over the world. The role of mechanical bowel preparation in preventing complications is recently disputed. The aim of the study was to assess whether elective colorectal surgery can be performed without mechanical bowel preparation. This cross sectional comparative study was carried out to assess the role of mechanical bowel preparation in post-operative complications in elective colon and rectal surgery in the department of surgery of Bangabandhu Sheikh Mujib Medical University, Dhaka Medical College Hospital and SSMC-Mitford Hospital during one year period. Fifty patients undergoing surgery for carcinoma of colon and rectum were included in the study. Patients were allocated in two groups by non-probability convenient consecutive technique-one group with mechanical bowel preparation with polyethylene glycol and one group with no preparation before surgery. All patients in the study group were followed up for at least one month after surgery for wound infection, anastomotic leakage and intra-abdominal infection. Total 50 patients were randomly divided into two groups (group A, 25 patients & Group B, 25 patients). Group A was the preparatory group and Group B was the non-preparatory group. The type of surgical procedure and the type of anastomosis did not differ significantly between two groups. Sixty percent patients of group A developed post-operative complications; on the other hand forty percent patients of group B developed post-operative complications. This study concluded that no advantage is gained by pre-operative mechanical bowel preparation and can be easily avoided in order to save the patient from unwanted events like nausea, vomiting, electrolyte imbalance and also increased chance of post-operative complication.

Key words- Mechanical bowel preparation, anastomotic leakage, colo-rectal surgery.

Introduction:

Infectious complications including anastomotic and wound dehiscence are major causes of mortality and morbidity in colorectal surgery¹. Pre-operative mechanical bowel preparation is practiced for many years to prevent post-operative complications in elective colon and rectal surgery. But there is paucity of data showing that mechanical bowel preparation by itself separately from other peri and per-operative measures actually reduce anastomotic and wound dehiscence. Mechanical bowel preparation is done to clean the large bowel of faecal content thereby reducing the rate of infection caused by colonic bacteria. Traditionally bowel cleansing was achieved using enemas in conjunction with laxatives². Recently more efficient cleansing can be done using new bowel preparation agent, such as poly ethylene glycol that induce diarrhea and cleanse the bowel of solid faecal matter.

Mechanical bowel cleansing has some theoretical advantages. It may decrease the intraluminal bacterial load, prevent disruption of anastomosis by passage of hard

faecal mass and decrease operating time by improving bowel handling during construction of anastomosis. In practice, mechanical bowel preparation doesn't alter concentration and slightly modifies the relative composition of faecal flora³. A meta-analysis found that, contrary to expectation use of mechanical bowel preparation significantly increased the risk of anastomotic leakage and wound infection⁴.

Methods

This cross sectional comparative study was carried out to assess the role of mechanical bowel preparation in preventing post-operative complications in elective colon and rectal surgery in the department of surgery of Bangabandhu Sheikh Mujib Medical University, Dhaka Medical College Hospital and SSMC-Mitford Hospital during the period of one year. Fifty patients between 32-50 years of age irrespective of gender were included in this study. Patients over 50 years of age immunocompromised patients, patient with inflammatory bowel disease were excluded from the study.

Results

Total 50 patients of both sexes were entered into this study according to the inclusion and exclusion criteria during the period of one year. The total patients were randomly divided into two groups (group A & Group B). Group A was the preparatory group and Group B was the non-preparatory group.

Dr. Molla Sharfuddin Ahmad, MCPS (Surgery), MS (General Surgery), Senior Consultant, Dept. of Surgery, Faridpur Medical College Hospital, Faridpur.

Correspondence to:

Dr. Molla Sharfuddin Ahmad, MCPS (Surgery), MS (General Surgery) Senior Consultant, Department of Surgery Faridpur Medical College Hospital, Faridpur.
Email: drmsahmad64@gmail.com

Table 1: Distribution of patients groups by sex.

Sex	Groups		P value
	Group A	Group B	
Male	18(72.0)	13(52.0)	0.145
Female	7(28.0)	12(48.0)	
Total	25(100.0)	25(100.0)	

Chi-square test was done to measure the level of significance. Figure within parenthesis indicates the percentage.

Table-2: Distribution of patients groups by age.

Age(in years)	Groups		P value
	Group A	Group B	
≤30	11(44.0)	9(36.0)	0.409
31-50	13(52.0)	11(44.0)	
>50	1(4.0)	5(20.0)	
Total	25(100.0)	25(100.0)	
Mean ±SD	34.80 ±11.72	37.80 ±13.70	

*test was done to measure the level of significance. Figure within parenthesis indicates the percentage. Sex and age distribution of the study subjects by groups were shown in Table-1 & 2. Mean age and sex distribution did not differ significantly.

Table 3: Distribution of preoperative diagnosis (carcinoma) by groups.

	Groups		P value
	Group A	Group B	
Carcinoma	25(100.0)	25(100.0)	0.999
Total	25(100.0)	25(100.0)	

*Fisher's exact test was done to measure the level of significance. Figure within parenthesis indicates percentage. In both group A & B 25 patients had carcinoma colon in each group (table 3)

Table 4: Distribution of adverse effects and precaution with poly ethylene glycol.

Poly-ethylene Glycol	Groups		P value
	Group A	Group B	
Adverse effects	20(80.0)	2(8.0)	0.001
Precaution	20(80.0)	2(8.0)	0.001

Chi square test was done to measure the level of significance. Figure within parenthesis indicates percentage. Eighty percent of the Patients in Group A had adverse effects like nausea, vomiting, bloating, loose motion and precaution had to be taken for them whereas only 8% of Group B had the same adverse effects which is highly significant between two groups (Table 4).

Table 5: Distribution of per-operative events by groups

Per operative events	Groups		P value
	Group A	Group B	
Per-operative antibiotic	25(100.0)	25(100.0)	Not done
Transfusion	24(96.0)	23(92.0)	0.999

*Fisher's exact test was done to measure the level of significance. Figure within parenthesis indicates percentage. All the patients of both groups were given per-operative antibiotics whereas 24 patients of Group A and 23 patients of Group B were given transfusion, but it does not differ significantly (Table 5).

Table 6: Distribution of post-operative surgical complications by groups (Follow up up to 7th POD)

Post-Operative Surgical complications	Groups		P value
	Group A	Group B	
Wound Infection	10(40.0)	7(28.0)	0.001
Anastomotic leak	2(8.0)	2(8.0)	ns
Intra-abdominal abscess	2(8.0)	1(4.0)	0.001
Peritonitis	1(4.0)	0(0.0)	0.001
Total	15(60.0)	10(40.0)	

*Chi-square test was done to measure the level of significance. Figure within parenthesis indicates percentage. Majority of the patients of Group A developed post-operative surgical complications. The majority number of patients of Group A developed surgical wound infection (40%) followed by anastomotic leak, Intra-abdominal abscess and peritonitis whereas in Group B wound infection developed in 28% patients. The post-operative complications were significant between the two groups (Table 6).

Table 7: Distribution of post-operative Non-surgical Complication by groups (Follow up upto 7th POD)

Post-Operative non-surgical complications	Groups		P value
	Group A	Group B	
Respiratory	5(20.0)	2(8.0)	0.001
Cardiac	1(4.0)	0(0.0)	0.001
UTI	7(28.0)	3(12.0)	0.001
Total	13(52.0)	5(20.0)	

Among non-surgical post-operative complications UTI was high in group A followed by respiratory and cardiac ones. On the other hand, respiratory complications and UTI developed in 2 and 3 patients respectively in Group B (Table 7).

Table 8: Distribution of re-intervention by groups

Re-intervention	Groups		P value
	Group A	Group B	
Anastomotic leak	2(8.0)	2(8.0)	ns
Intra-abdominal abscess	6(24.0)	3(12.0)	0.001
Peritonitis	2(8.0)	1(4.0)	0.001
Total	10(40.0)	6(24.0)	

Chi square test was done to measure the level of significance. Out of 25 patients of Group A who developed post-operative surgical complications, 10(40%) patients underwent re-intervention. Among them 2(8%) were for anastomotic leak and 6(24%) for intra-abdominal abscess. But 2(8%) for anastomotic leak and 3(12%) for intra-abdominal abscess from Group B needed re-intervention, which was significant statistically (Table 8).

Discussions

Preparation for elective colon and rectal surgery with mechanical cleansing and antibiotic prophylaxis, in conjunction with improved surgical techniques and advances in Preoperative care, served to reduce the rate of infectious complications in colorectal surgery. Although mechanical bowel preparation before elective colorectal surgery has become a surgical dogma, there is a paucity of scientific evidence demonstrating the efficacy of this practice in reducing the rate of infectious complications.

Further evidence questioning the utility of mechanical bowel preparation in colorectal surgery comes from the literature regarding the management of urgent cases, such as patients with penetrating colonic trauma or acute colonic obstruction. In cases of penetrating trauma, prospective randomized studies have shown that primary colonic anastomosis is safe even though the colon is not prepared¹. In cases of acute colonic obstruction, resection with primary anastomosis in one stage is not the common practice, as the colon is not prepared. Few authors however, have challenged the dogma that colon resection with primary anastomosis is unsafe in patients with obstructing colon lesions. Few suggested that anastomosis between the small bowel and the colon, as performed in right or subtotal colectomy, may be safe without mechanical preparation since this type of anastomosis avoids the stool column proximal to the anastomosis². Other authors have suggested that colo-colonic anastomosis may also be safe in an unprepared bowel in the face of an obstructed colon^{2,3,4}. Recently, Naraynsing and his co-workers reported a prospective series of 58 unselected patients with left colonic obstruction⁵. All underwent segmental colonic resection with primary colo-colonic anastomosis, without a proximal diverting stoma. There was one case of anastomotic leak and one mortality, unrelated to infection.

Efficient mechanical bowel preparation is generally supposed to help to prevent infectious complications after

colorectal surgery. Theoretically, this procedure diminishes faecal load in the bowel and prevents disruption of the anastomosis by reduction of faecal impaction at the site of the anastomosis. Therefore, the risks of faecal contamination or infection of the peritoneal cavity and the abdominal wound are thought to be decreased. However, mechanical bowel preparation liquefies solid faeces, which could increase the risk of intraoperative spillage of contaminant^{6,7}. Although some investigators believe that mechanical bowel preparation can reduce the bacterial load in the bowel, the large number of microorganisms in the digestive tract makes this almost impossible^{8,9}. Mechanical bowel preparation has been shown to have potentially negative side-effects in terms of bacterial translocation^{10,11}, electrolyte disturbance¹² and discomfort to patients^{12,13}. Despite these drawbacks, mechanical bowel preparation is still commonly practiced in colorectal surgery, without evidence from randomized trials that it decreases complication rates in patients¹⁴.

Mechanical bowel preparation is not harmless. It almost invariably causes significant discomfort to the patient, including nausea, abdominal bloating, and diarrhea^{15,16}. Mechanical bowel preparation is also associated with electrolyte imbalance and dehydration which may complicate the induction of anesthesia and peri-operative care¹⁶. Zmora et al stated that mechanical bowel preparation should be treated as a medication and used only when indicated². The result of my study was consistent with their findings and I also agree to their proposal.

Miettinen RP study¹⁶ did not show any differences in anastomotic leakage between patients who were given preoperative mechanical bowel preparation before elective colorectal surgery and those who were not. In their study, mortality and length of hospital stay were also similar in the two groups. But those differed in my study. In this study, there was no death, but length of hospital stay was more in Group A than that in Group B (14.9±13.1 days vs. 9.8±3.8 days). Zmora et al² concluded that elective colon and rectal surgery may be safely performed without the use of routine mechanical bowel preparation.

Miettinen RP et al¹⁶ also concluded that elective colorectal surgery can be safely done without mechanical bowel preparation. In view of possible disadvantages of this practice, patient discomfort, and the absence of clinical value, they advised that mechanical bowel preparation before elective colorectal surgery should be abandoned. The results of my study strongly supported their opinion.

Conclusion

Considering the findings of this study and reviewing literatures it can be concluded that mechanical bowel preparation before elective colon and rectal surgery cannot prevent wound infection, intra-abdominal sepsis, abdominal abscess and without any mechanical preparation of the bowel colorectal surgery can be done safely.

References

1. Sasaki LS, Allaben RD, Golwala R, Mittal VK. Primary repair of colon injuries: a prospective randomized study. *J Trauma* 1995; 39(5):895-901.
2. Zmora O, Mahajna A, Bar-Zakai B, Rosin D, Hershko D, Shabtai M, et al. Colon and Rectal surgery without Mechanical Bowel preparation. *Ann Surg.* 2003; 237(3):363-367.
3. Dorudi S, Wilson NM, Heddle RM. Primary restorative colectomy in malignant left-sided large bowel obstruction. *Ann R Coll Surg Engl.* 1990; 72: 393-395.
4. Santos JC Jr, Batista J, Sirimarco MT, Guimaraes AS, Levy CE. Prospective randomized trial of mechanical bowel preparation in patients undergoing elective colorectal surgery. *Br J surg.* 1994; 81(11):1673-6.
5. Naraynsingh V, Rampaul R, Maharaj D, Kuruvilla T, Ramcharan K, Pouchet B. Prospective study of primary anastomosis without colonic lavage for patients with an obstructed left colon. *Br J Surg.* 1999; 86: 1341-1343.
6. Mahajna A, Krausz M, Rosin D, Shabtai M, Hershko D, Ayalon A, et al. Bowel preparation is associated with spillage of bowel contents in colorectal surgery. *Dis Colon Rectum* 2005; 48:1626-1631.
7. Scabini S, Rimini E, Romairone E, Scordamaglia R, Damiani G, Pertile D, Ferrando V. Colon and rectal surgery for cancer without mechanical bowel preparation: one-center randomized prospective trial. *World J Surg Oncol.* 2010 Apr 30;8:35.
8. Fa-Si-Oen PR, Roumen RM, Buitenweg J, et al. Mechanical Bowel Preparation or not? Outcome of a multicenter, randomized trial in elective open colon surgery. *Dis Colon Rectum* 2005, 48:1509-1516.
9. Poole GV. Spontaneous bacterial peritonitis during bowel preparation: an example of clinical translocation. *South Med J.* 1991; 84:1412-1413.
10. Kale TI, Kuzu MA, Tekeli A, Tanik A, Aksoy M, Cete M. Aggressive bowel preparation does not enhance bacterial translocation, provided the mucosal barrier is not disrupted: a prospective, randomized study. *Dis Colon Rectum* 1998; 41:636-641.
11. Frizelle FA, Coils BM. Hyponatremia and seizures after bowel preparation: report of three cases. *Dis Colon Rectum* 2005; 48:393-396.
12. 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 Ailed* 2003: 163:803-808.
13. Platell C, Barwood N, Makim G. Randomized clinical trial of bowel preparation with a single phosphate enema or polyethylene glycol before elective colorectal surgery. *Br J Surg.* 2006; 93:427-443.
14. Burke P, Mealy K, Gillen P, Joyce W, Traynor O, Hyland J. Requirement for bowel preparation in colorectal surgery. *Br J Surg.* 1994; 81:907-910.
15. Brownson P, Jenkins SA, Nott D, Ellenbogen S. Mechanical bowel preparation before colorectal surgery: results of prospective randomized trial *Br J Surg.* 1992; 79:461-462.
16. Miettinen RP, Laitinen ST, Makela JT, Paakkonen ME. Bowel preparation with oral polyethylene glycol electrolyte solution versus no preparation in elective open colorectal surgery: prospective, randomized study. *Dis Colon Rectum* 2000; 43:669- 675.