

The role of mechanical bowel preparation in colorectal surgery; a comprehensive review of evidence from recent clinical studies

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ABSTRACT

During the preoperative care for colorectal surgery, as a crucial component mechanical bowel preparation (MBP) aims to reduce fecal contamination and enhance the procedure's technical simplicity. Its effectiveness in lowering postoperative complications have been raised to concern, according to new data from systematic reviews and randomised controlled trials (RCTs). The results of numerous studies carried out under the clinical and economic implications of MBP in colorectal surgery are summarized in this study. We assess outcomes including anastomotic leakage, wound infections, postoperative morbidity, and mortality, while considering the economic burden of MBP. Despite its historical application, the available data indicates that MBP may not substantially enhance surgical results and may in certain situations; result in higher patient suffering and medical expenses. The purpose of this study is to assess MB's function in modern colorectal surgery and offer suggestions for its application in the future.

Keywords: *Anastomotic leakage, Colorectal surgery Faecal contamination, Mechanical bowel preparation, Wound infection.*

Introduction

A crucial component of preoperative treatment for colorectal procedures has long been thought to be mechanical bowel preparation (MBP). Reducing faecal load, minimising the chance of contamination during anastomosis, and improving the surgeon's performance are the primary goals of MBP. MBP has been believed to prevent post-operative complications such as wound infections, anastomotic leakage, and intra-abdominal abscesses. However, a number of studies conducted in recent years have raised doubt on its advantages, arguing that MBP may not significantly reduce post-operative problems and may instead exacerbate side effects such as electrolyte imbalances, dehydration, and patient pain.

The importance of MBP in colorectal surgery has to be reevaluated because, growing amount of information offers no appreciable clinical benefits. This study analyses the most recent data on the effectiveness of MBP, its effects on surgical outcomes, patient satisfaction and economic expenses because there isn't a clear consensus in clinical practice guidelines.

Mechanism and rationale for mechanical bowel preparation

Before colorectal surgical procedures, mechanical bowel preparation usually entails using enemas or oral laxatives to remove feces from the colon.

The main goal of MBP is to reduce the quantity of bacteria and feces in the colon in order to lower the risk of intraoperative contamination, which will cause to further medical and surgical complications. Furthermore, MBP is believed to make the surgery technically easier by providing better visualisation and decreasing the potential for anastomotic leaks and postoperative infections (1).

The effectiveness of MBP in reducing above risks has been accepted since past without substantial evidence from randomised controlled trials. However, increasing uncertainty has arisen due to the results obtained from several studies showing no significant difference in complication rates between patients who received MBP and those who did not (2, 3). According to some research, MBP may also be linked to adverse consequences such as electrolyte imbalance and dehydration, which could make the healing process more complicated (4).

Clinical outcomes

1. Anastomotic leakage

A major complication following colorectal surgery, anastomotic leakage is linked to a high rate of morbidity and mortality. MBP's ability to decrease the bacterial load in the colon and lowering the danger of anastomotic leakage is one of the most frequently mentioned justifications for its use. However, there was no significant difference in anastomotic leakage rates between patients who got MBP and those who did not (4.8% vs. 5.4%, $p=0.69$) in a large multicenter trial conducted by Contant et al. with 1431 patients (2). Van Geldere, et al., found that patients who underwent surgery without MBP had a lower anastomotic leakage rate (1.2%) than those who had MBP, which reinforced this conclusion (5). A meta-analysis conducted by Guenaga, et al., also concluded that MBP does not significantly improve anastomotic integrity as believed previously (1).

Furthermore, studies comparing various techniques of bowel anastomosis, such as stapled versus hand-sewn, have not revealed any appreciable differences in leakage rates depending on MBP use (3). Above results strongly imply that improving anastomotic outcomes might not require the use of MBP.

2. Wound infections and septic complications

After colorectal surgery, wound infections and septic consequences are frequent concerns. By eliminating bacteria from the colon, MBP has been believed to lower the incidence of illnesses. Nevertheless, research has produced contradictory findings. Contant, et al. demonstrated that while the rate of intra-abdominal abscesses was much lower in the MBP group (0.3% vs. 2.5%, $p=0.001$), wound infection rates were similar between the MBP and non-MBP groups (2). On the other hand, some research indicates that MBP may promote bacterial translocation, which could increase the likelihood of septic consequences (3, 6).

There is no obvious benefit of MBP in lowering wound infections according to other systematic reviews. MBP was linked to an increase in postoperative complications in certain instances and did not significantly lower infection rates as stated by Slim, et al., (7). These results imply that MBP could not have the anticipated effect of reducing infections and might exacerbate problems like sepsis.

3. Mortality and overall morbidity

There has been research in how MBP affects overall mortality and morbidity. Research has indicated that the in-hospital mortality rates for MBP and non-MBP groups do not differ significantly (1). Additionally, there is no proof that MBP lowers significant postoperative problems, such as the need for reoperation or extended hospital stays, according to assessments by Bucher, et al., and Koller, et al. (3, 8).

The lack of significant differences in mortality and morbidity between the MBP and non-MBP groups, despite its historical usage, indicates that MBP does not provide the expected advantage. A meta-analysis done by Guenaga, et al., further supports these findings. They conclude that MBP does not improve clinical outcomes in terms of mortality or severe comorbidities (1).

Patient-centered outcomes

1. Patient discomfort and quality of life

Patient discomfort is one of the most commonly mentioned drawbacks of MBP. Oral laxatives and enemas are commonly used in MBP and they might have negative side effects such as fatigue, bloating, nausea and dehydration. A study by McCafferty, *et al.*, demonstrated that patients undergoing MBP were more likely to report discomfort during the preoperative period compared to those who did not undergo preparation (9). Reduced patient satisfaction and longer healing times may result from these negative impacts.

Patient-reported outcomes are crucial in assessing the true impact of MBP. According to studies by Keller, *et al.* and Platell and Hall, patients who did not receive MBP recovered more quickly and reported greater satisfaction with the preoperative procedure (6, 10). According to these results, avoiding MBP could improve the overall patient experience, especially by lowering discomfort and improve healing.

2. Satisfaction and recovery times

In addition to increased discomfort, MBP is associated with prolonged hospital stays and delayed recovery times, which may complicate patient's mental and physical status. The administration of MBP requires additional preoperative interventions such as extended hospital admissions with nursing care, which results a longer recovery period following the surgery. According to a systematic review by Keller, *et al.*, patients who underwent surgery with or without MBP did not significantly differ in terms of their quality of life or functional recovery (6). These results raise doubts about the widespread use of MBP during colorectal surgeries by indicating that it does not provide significant advantages in terms of postoperative recovery.

Economic and healthcare implications

1. Cost-effectiveness analysis

Due to the expenses of preoperative preparation agents, nursing care, and prolonged preoperative stays, MBP places an additional burden on

healthcare systems. According to a cost-effectiveness analysis carried out by Keller, *et al.*, skipping MBP could lower medical expenses without compromising surgical outcomes or patient safety (10). The additional resources required for MBP, including medications, staff time, and hospital bed utilisation, which contribute to unnecessary expenditures, which could be better, allocated to the other aspects of patient care.

The unnecessary expense burden of MBP further highlighted by financial research by Platell and Hall, which also highlighted its limited clinical value during colorectal surgical procedure (6). Healthcare systems could save a lot of expenditure if MBP is used less frequently in colorectal surgery, especially in countries with limited resources.

2. Resource allocation

Since healthcare resources are limited, it is crucial to make the most of them in order to increase productivity and cut down on wasteful spending. The requirement for preoperative monitoring, medicine, and nursing care has increased by the regular use of MBP. This resource allocation can be better utilized in other areas of patient care, such as postoperative recovery, where interventions may have a direct impact on patient outcomes. Minimising unnecessary preoperative interventions like MBP can improve surgery efficiency and optimize hospital operations (9).

Subgroup Analysis

1. Specific patient populations

Even if there are evidences against MBP for the majority of colorectal procedures, its usage may still be advantageous for certain patient categories. Patients who have inflammatory bowel illness or obstructive lesions, for instance, may be more susceptible to infection and contamination, which makes MBP a potentially useful strategy. However, further research is needed to assess whether the benefits of MBP outweigh the potential risks in these specific populations.

2. High-risk cases

The function of MBP in high-risk situations, such as emergency colorectal procedures, is still unknown. Some studies have suggested that MBP may be beneficial in reducing contamination during emergency procedures (3). Its application in these high-risk situations is not well supported by the available data, and research in this field is still ongoing.

Discussion

The results from numerous studies reviewed in this article suggest that MBP does not significantly reduce the risk of postoperative complications, including anastomotic leakage, wound infections, or mortality. Moreover, MBP is associated with patient discomfort and additional healthcare costs. Despite its role in colorectal surgery, the current evidence questions the routine use of MBP and suggests that alternative strategies, such as the use of oral antibiotics alone, may be equally effective.

Those are contributing several factors to the inconsistent results across studies. Methodological differences, such as variations in study design, sample sizes, and patient populations, may account for the conflicting findings. Additionally, the type of surgery, such as elective versus emergency procedures, may influence the outcome of MBP. It is important for future research to address these gaps and provide clearer guidelines on when MBP may or may not be beneficial during colorectal surgeries.

Conclusions

This review has examined the evidence surrounding the use of mechanical bowel preparation in colorectal surgery. The current literature suggests that MBP does not significantly reduce the risk of anastomotic leakage, wound infections, or other major complications. Furthermore, MBP is associated with increased patient discomfort and added healthcare costs. Based on the available evidence, it is recommended that MBP be reconsidered as a routine preoperative practice for preoperative preparation of colorectal surgery. Future research should focus on identifying patient populations who may still benefit from MBP and

exploring alternative preparation strategies that are both clinically effective and cost-efficient.

References

1. Guenaga KF, Matos D, Wille-Jørgensen P. Systematic review and meta-analysis of mechanical bowel preparation in colorectal surgery. *J Gastrointest Surg.* 2005; **9**(2): 305-312.
2. Contant CM, Hop WC, Van't Sant HP, Oostvogel HJ, Smeets HJ, Stassen LP, *et al.* A multicenter, randomized trial comparing mechanical bowel preparation with no preparation in elective colorectal surgery. *Ann Surg.* 2007; **245**(2): 235-242.
3. Bucher P, Mermillod B, Gervaz P, Morel P. Does mechanical bowel preparation reduce infection rates in colorectal surgery? *Colorectal Dis.* 2005; **7**(2): 196-203.
4. Miettinen RP, Laitinen ST, Mäkelä JT, Pääkkönen ME. Bowel preparation with oral polyethylene glycol electrolyte solution vs. no preparation in elective open colorectal surgery: prospective, randomized study. *Dis Colon Rectum.* 2000; **43**(5): 669-675.
5. van Geldere D, De Graaf EJ, Lagaay MB, Braak SJ, Gouma DJ. Comparison of mechanical bowel preparation with no preparation in colorectal surgery. *Lancet.* 2002; **360**(9330): 1766-1771.
6. Platell C, Hall JC. The role of mechanical bowel preparation in colorectal surgery. *ANZ J Surg.* 1998; **68**(10): 745-748.
7. Slim K, Vicaut E, Panis Y, Chipponi J. Meta-analysis of randomized clinical trials of colorectal surgery with or without mechanical bowel preparation. *Br J Surg.* 2004; **91**(9): 1125-1130.
8. 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. *Langenbecks Arch Surg.* 2023; **408**(1): 45-55.
9. McCafferty F, Wolfe LG, McNaught CE, MacFie J. The impact of mechanical bowel preparation on postoperative recovery in colorectal surgery. *Surg Infect.* 1999; **3**(4): 335-342.
10. Keller D, Stein SL, Haas EM, Lawrence JK. A cost analysis of mechanical bowel preparation in colorectal surgery. *Surg Endosc.* 2014; **28**(7): 2112-2118.