

# A Review of Current Research on Preoperative Bowel Preparation for Colorectal Cancer

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**Abstract:** Colorectal cancer is one of the most common malignant tumors in China, and radical surgery is the first choice of treatment for colorectal cancer. With the development of the level of medical technology, colorectal cancer surgery has also undergone continuous improvement and has been widely used in clinical practice. However, surgical complications such as anastomotic leakage and postoperative infection are still the main problems of surgery, and there is still no thorough solution. Bowel preparation can clean the feces in the intestines and reduce the number of intestinal flora, which in turn reduces the incidence of postoperative complications. The current mainstream concept is that mechanical bowel preparation can effectively reduce the incidence of postoperative infection and anastomotic leakage, and is the preferred method of bowel preparation for colorectal surgery. There are many specific methods of preoperative bowel preparation, and since each method has its own advantages and disadvantages, there is still no recognized optimal solution, so it is necessary to choose the appropriate method according to the different conditions of individual patients.

**Keywords:** Colorectal Cancer; Bowel Preparation; Malignant Tumors; Radical Surgery

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## 1. Introduction

Colorectal cancer is the malignant tumor of the digestive tract with the highest incidence rate in the world, and the incidence rate is increasing every year, with a tendency of the incidence of the population being younger, and the incidence rate of the population aged 30 years old and below is much higher than that of other countries. The treatment of choice is radical surgical resection, and good bowel preparation is an important factor affecting the overall quality of surgery. It is generally recognized that mechanical bowel preparation (MBP) can effectively remove feces from the intestinal tract, reduce the number of bacteria in the intestinal tract, facilitate intraoperative operation, and thus effectively reduce the incidence of postoperative complications. Bowel preparation has been applied and developed for many years, and a variety of programs are now available, and the current status and progress of preoperative bowel preparation for colorectal cancer are now reviewed.

## 2. Current status of preoperative bowel preparation for colorectal cancer

Since mechanical bowel preparation was applied to colorectal surgery in the middle of the last century, after years of clinical experience and a large number of experimental studies, it has been confirmed that MBP can significantly reduce the incidence of postoperative complications and patient mortality rate in colorectal surgery. The traditional bowel preparation (Traditional bowel preparation, TBP) method for the preoperative 3d every night and the early morning of the day of surgery are clean enema, this method of intestinal damage to the patient is larger, and the patient's tolerance is poor, increasing the patient's pain, there are many drawbacks, in the early years of the It was reported in the literature that the incidence of postoperative incision infection and anastomotic leakage was not significantly reduced in patients undergoing elective colorectal surgery with MBP compared with those without MBP, and on the contrary, intraoperative expansion of the intestinal lumen was more pronounced, which was not convenient for surgical operation.<sup>[2-4]</sup> With the emergence of new

intestinal cleansing drugs such as polyethylene glycol, TBP has been gradually replaced by the simpler, more efficient, and safer rapid bowel preparation (Rapid bowel preparation, RBP). RBP is based on oral diarrhea-inducing drugs, which reduces and even abandon enema, bowel cleansing effect is comparable to TBP, but less damage to the intestinal tract, patient compliance is high, the use of the clinical application of the increasingly popular. The American Association of Colorectal Surgeons (The American Society of Colon and Rectal Surgeons ASCRS) recommends MBP in combination with oral antibiotics as the preferred method of bowel preparation for colorectal surgery. MBP has now become one of the essential steps before colorectal surgery.

### **3. Bowel preparation methods and medications**

#### **3.1 Enema**

TBP requires that enemas be given every night for 3d before surgery, and clean enemas are given again in the morning on the day of surgery until the patient discharges clear water without fecal sludge.<sup>[5]</sup> This preparation method can effectively clean up the feces in the intestinal lumen, but due to repeated enemas, it destroys the intestinal mucosa causing edema and congestion of the intestinal wall, which affects the intraoperative field of vision and intestinal anastomosis to a certain extent, and it is easy to cause electrolyte disorders, and the patient's adherence is relatively poor, and the rate of completion of the intestinal preparation is relatively low.<sup>[6-9]</sup> Although TBP has many disadvantages and is less used clinically, it is still a necessary choice for colorectal cancer patients with preoperative combined intestinal obstruction or difficulty in taking oral medication. Specific enemas are categorized as follows.

##### **3.1.1 Cleansing enema**

Repeatedly through the anus into the liquid, the feces will be cleaned out of the body, the enema time is often not fixed, depending on the degree of cleanliness and other specific circumstances. This method has the highest cleaning efficiency and is the most commonly used clinical enema method. Enema commonly used solution for 1%-2% soapy water, saline or water.

##### **3.1.2 Electrolyte fluid enema**

The use of sodium phosphate salt solution enemas creates a hypertonic environment in the intestines, increasing fecal water and facilitating elimination. This method requires a smaller dose and is suitable for patients who do not tolerate cleansing enemas. However, the cleansing effect is relatively poor, and it is often used as an alternative to cleansing enemas in clinical practice.

#### **3.2 Oral medication**

TBP because of repeated enema on the intestinal damage, and patient tolerance is poor, increase patient pain, clinical routine preoperative intestinal preparation more often choose oral drug method.RBP that is to oral polyethylene glycol and other laxatives, give up the traditional enema intestinal preparation method. The process of this method is simple, less damage to the intestinal tract, and the patient tolerance is good, the degree of cleanliness is not significantly different from TBP, so the current clinical application is the most widely used. The commonly used oral drugs and specific methods are as follows.

##### **3.2.1 Polyethylene glycol**

PEG is a macromolecule polymer that absorbs water from the intestinal tract to increase the water content of the feces and facilitate its expulsion. Yan Xin et al. showed that PEG is not absorbed by the intestinal tract, does not damage the intestinal mucosa, does not destroy the normal intestinal flora, and has a better cleanliness and safety.PEG electrolyte powder needs to be dosed with 2,000 to 3,000mL of water according to the specifications, and then 250mL of it should be consumed each time in the preoperative period, with an interval of 15 minutes between each time, and then consume it all in 2 hours, until the watery stools are discharged without fecal sludge, and no enema is needed in the routine. No enema was needed. It was well tolerated by patients and had a high completion rate. Compared with other oral drugs, there is no difference in the effect of intestinal cleansing, and the recovery of intestinal function after surgery is faster, with fewer postoperative adverse

reactions.

### **3.2.2 Lactose**

Lactulose is a synthetic disaccharide of fructose and galactose, with osmotic activity, forming a hypertonic environment in the intestinal lumen after oral intake, increasing the water content of feces and making it easier to discharge. And lactulose can form acetic acid after being decomposed by intestinal flora, which can reduce intestinal pH value, stimulate intestinal peristalsis, and induce diarrhea with relatively mild effect. Because lactulose is almost not absorbed by the intestinal tract, basically no effect on blood glucose, so the diabetic population can also apply. Ci611 for colonoscopy bowel preparation patients study found that oral lactulose compared with polyethylene glycol solution bowel preparation effect and the overall quality of the examination is not significantly different. There are even several domestic and international research reports confirming the safety and efficacy of lactulose as a bowel preparation drug. Regarding preoperative bowel preparation for colorectal cancer, most of them reported that the use of PEG in combination with lactulose has good effects, but few of them used lactulose alone as a bowel preparation drug. The use of lactulose in preoperative bowel preparation for elective colorectal cancer is still in the exploratory stage.

### **3.2.3 Sodium phosphate**

It belongs to osmotic laxative, and its mechanism of action is similar to PEG, which is taken orally in the preoperative Id, and then drinking 1000mL of water, which requires less taking and has excellent bowel cleansing effect. Lu Xin et al concluded that the sodium salt solution of pitric acid is safe and effective for bowel preparation, shortens the bowel preparation time compared with TBP, and reduces the incidence of patient discomfort and postoperative intestinal flora disorders.

### **3.2.4 Magnesium sulfate**

It is a volumetric laxative, which absorbs intestinal water and increases the volume of fluid in the intestinal lumen after taking it, thus stimulating intestinal motility and promoting defecation. Magnesium sulfate can also promote duodenal secretion of cholecystokinin, stimulate the secretion of intestinal fluid, accelerate intestinal peristalsis.

### **3.2.5 Mannitol**

It is a hypertonic dehydrating agent, which can cause osmotic diarrhea after taking it, and the dose is 250-1000mL, which needs to be consumed in a short period of time to maximize the effect. It is irritating to the gastrointestinal tract and produces flammable gas when decomposed in the intestinal lumen, and the use of high-frequency electro-surgical knife during the operation involves a great risk, so mannitol has been banned as a preoperative intestinal preparation drug in most of the regions at present.

### **3.2.6 Senna**

Clinical commonly used oral slow diarrhea Chinese medicine, You Fuzhen et al. proposed oral senna than mannitol gastrointestinal reaction is lighter, postoperative gastrointestinal function faster recovery, has obvious advantages. However, the mechanism of action of senna is to directly stimulate the nerve of the intestinal wall, the stimulation intensity is large, often causing nausea and vomiting, abdominal pain, gastrointestinal bleeding, etc., and it should be used with caution for patients with poor tolerance.

## **4. Bowel preparation nutritional support**

### **4.1 Dietary management**

Regardless of the method of bowel preparation, dietary management is an essential and important component. The traditional method is to give semi-liquid diet 2-3d before surgery, Id liquid diet before surgery, and fasting before surgery Id 22:00. Restriction of diet will to some extent affect the preoperative nutritional status of the body of surgical patients, resulting in insufficient intake of energy and various nutrients, which is not conducive to postoperative recovery. Especially for patients with clear preoperative nutritional risk, dietary restriction is likely to aggravate the risk or even postpone surgery.

The current recommended method is not strict dietary restriction for 3d before surgery, and preoperative Id fluid diet. Several studies have demonstrated that this approach does not affect intestinal cleanliness and significantly improves preoperative nutritional deficiencies compared with traditional methods.

## 4.2 Enteral nutrition

Preoperative application of enteral nutrition agents can significantly improve the nutritional status of patients, and enteral nutrition preparations should be routinely applied to all patients with nutritional risks when they are admitted to the hospital to prepare for surgery. The dietary restrictions required for bowel preparation easily lead to insufficient nutritional and energy intake, so for general patients, the preoperative prophylactic use of enteral nutritional preparations can effectively increase the body's nutritional reserves, improve surgical tolerance, and accelerate postoperative recovery.

## 5. Concluding remarks

This thesis systematically summarizes the current status of preoperative bowel preparation for colorectal cancer and commonly used drugs and methods. It is hoped that the research in this paper will be beneficial to improve the quality of colorectal cancer surgery.

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