

## The Role of Mechanical Bowel Preparation in minimally invasive gynaecological surgery

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### Abstract

**Introduction**-Various combinations of dietary restriction, antibiotic regimens, and mechanical preparations have become routine in preoperative surgical planning for elective colon surgery. This practice has also become commonplace in the field of gynaecology, either for planned bowel surgery or in complex cases that are believed to be high risk for inadvertent bowel injury. As the trend in gynaecologic surgery shifts toward more minimally invasive approaches, the complexity of cases being performed by laparoscopy and robotics continues to increase.

**Objective**-To examine the influence of mechanical bowel preparation on surgical field visualization and patients' quality of life during minimally invasive gynaecologic procedures.

**Method**- We conducted study and extracted data . A total of 50 women seeking gynaecological care , perspectives were taken on advantages, disadvantages, hospital stay and Postop complications of different types of bowel preparation.

**Result**- Fifty patients were randomized as follows: 15 to liquid diet, 15 to mechanical bowel preparation, and 15 to minimal residue diet. Most characteristics were similar across groups.

### Introduction

Bowel preparation traditionally refers to the removal of bowel contents via mechanical cleansing measures. Although it has been a common practice for more than 70 years, its use is based mostly on expert opinion rather than solid evidence. Mechanical bowel preparation in minimally invasive and vaginal gynecologic surgery is strongly debated, since many studies have not confirmed its effectiveness, neither in reducing postoperative infectious morbidity nor in improving surgeons' performance.

We aimed to determine the best practice regarding bowel preparation before these surgical approaches. In previous studies, bowel preparation was evaluated only via mechanical measures. The identified randomized trials in laparoscopic approach and in vaginal surgery were 8 and 4, respectively. Most of them compare different types of preparation, with patients being separated into groups of oral

### Method And Objective

We conducted a comprehensive search of the PubMed/ Medline and the Cochrane Database using the following terms: bowel preparation, intestinal preparation, and mechanical bowel preparation with minimally invasive gynecologic surgery and vaginal surgery, and related articles from the latest two decades up to June 2019 were scanned for relevance. We applied no restriction to region or publication type. Manuscripts published in any language other than English were excluded from our study. Abstracts were scanned for relevance from DM and PA, before appraising the full-text articles. The reference lists of all eligible published articles were crosschecked by FZ, TM, and HD. Manuscripts were selected by consensus of DM, PA, and FZ for a complete review and any uncertainties were resolved by consensus discussion with the senior author (TN).

The purpose of this review was to evaluate

## Results

*Bowel Preparation before Minimally Invasive Gynecologic Surgery.* In the field of BP in minimally invasive gynecologic surgery, most studies have specifically evaluated the use of mechanical BP measures. One of the main arguments, of those in favour of MBP, is the improvement of surgical field visibility and intra-operative bowel handling [8, 17]. Laparoscopic surgeons' choice of MBP as a preoperative standard is based on the idea that the empty bowel will occupy less space allowing for better carbon dioxide insufflation of the abdomen and, hence, a better view [4]. MBP use is also supported by the belief that it reduces the prevalence of faecal contamination in case of inadvertent bowel injury or scheduled bowel re-section, via decreasing the bacterial load [4, 8, 9]. As a result, it is believed that MBP protects against complications, such as surgical site infections, anastomotic leakage, and faecal peritonitis by minimising the faecal load of the bowel [6, 11, 12]. On the other hand, it is argued that laparoscopic surgery can be facilitated by the presence of solid matter inside the colon for gravity to help get a better view of the peritoneal cavity [7]. Furthermore, some studies suggest that MBP could increase the risk of anastomotic leakage, due to bowel irritation caused by the laxatives [10].

Most randomized controlled trials (RCTs) compare oral MBP to no preparation regimen, besides fasting or a type of low-residue diet [17–21]. Fewer studies compare oral MBP to enema MBP [11, 13]. Only a tiny part of them compare enema use to no MBP [8, 12] (Table 1).

It must be taken into account that some of the studies mentioned above exclude patients with suspected or anticipated malignancy, or with severe endometriosis, mainly in the cul de sac, because of possible enteric resection [8, 11–13, 17–20]. Similarly, obese patients that might require an advanced laparoscopic procedure and even patients with prior surgery to the pelvis or the abdomen did not meet the inclusion criteria [18, 19].

One of the very first randomized controlled trials studying different types of preoperative bowel preparation in gynaecology compares MBP with a 90mL oral solution of sodium phosphate vs no MBP in laparoscopy [18]. The results agreed with previously conducted trials with similar objectives in colorectal surgery [22]. While there was no significant difference from the surgeons' point of view (same operative time and difficulty, comparable scores concerning surgical field view), patients' experience was not the same between the 2 groups. In the MBP group, significantly higher discomfort was observed preoperatively, mainly because of insomnia, weakness, abdominal distension, hunger, thirst, nausea, and vomiting, in contrast to the no MBP group [18].

On the other hand, in an RCT by Won et al., which investigated the same parameters, intraoperative surgical exposure and bowel handling are statistically better in patients receiving MBP (oral sodium picosulfate) compared to those who either only fasted before laparoscopy or received a minimal residue diet for 2 days before the operation. Despite these results, the fasting-only approach was recommended after taking into consideration the distressfulness and the adverse effects of MBP on women [17]. Unlike Won et al., Bakay and Aytakin in 2017 investigated the field of vision and surgical comfort during total laparoscopic hysterectomy procedures in 102 patients, using a visual indexing tool based on anatomic landmarks and found no differences in surgical view or intraoperative time between the group receiving oral MBP and the only fasting one (mean operation time: oral sodium phosphate (NaP) group (47.42 min) vs no MBP group (48.54 min),  $p = 0.847$ ) [21].

In 2009, Lijoi et al., instead of evaluating MBP vs no MBP, compared a 7-day low fibre intake vs MBP consisting of four doses of a granular powder dissolved in 1,000 mL of water per dose, in gynecologic laparoscopic procedures. They reached similar conclusions as previously conducted studies, showing no difference in surgical field exposure, higher tolerance, and less discomfort preoperatively in the low fibre intake group compared to the MBP group. Surgical time was comparable between the two groups, as was the length of hospital stay (LOS) [19].

Several other studies have concluded that MBP can be well tolerated by patients preoperatively without any major discomfort, but as previously shown, according to the surgeons' point of view, no statistically significant difference was found regarding the surgical field between women who underwent MBP and those who did not. Interestingly, surgeons were able to correctly predict whether the patient was administered MBP or not, only in 55–59% of the cases [8, 20].

Studies assessing the use of bowel preparation in minimally invasive gynecologic surgery

Study (reference)	Regimen of BP compared (group size/no. of patients)		Outcomes of interest and results
Muzii et al. [18]	MBP-oral NaP (81)	No MBP (81)	Greater patients' discomfort in the MBP group No difference in surgeons' evaluation of the surgical field, operative difficulty, operative time, and postoperative complications
Lijoi et al. [19]	MBP-oral granular powder dissolved in 1000 mL (41)	1-week low fiber diet <10 g (42)	No difference in evaluation of surgical field and operative time Abdominal distension and overall discomfort were more frequent in MBP group No difference in postoperative pain, nausea, abdominal swelling, ileus rate, and LOS
Yang et al. [11]	MBP-oral NaP (72)	MBP-NaP enema (73)	No difference in evaluation of the surgical field, bowel handling, degree of bowel preparation, or surgical difficulty Abdominal bloating and swelling, weakness, thirst, dizziness, nausea, faecal incontinence, and overall discomfort were greater in the oral solution group
Won et al. [17]	Minimal residue diet + MPB-oral Na picosulphate (87)	Minimal residue diet (84)  (Fasting only (86)	Better surgical view with minimal residue diet + MBP No difference in complications Greater patients' symptoms in MBP group (headache, thirst, weakness, tiredness, and overall discomfort) by VAS
Siedhoff et al. [8]	MBP-single NaP enema (73)	No MBP (73)	No difference in anxiety by VAS No difference in evaluation of surgical field Same operative time and blood loss No difference in postoperative constipation or patients' rating of symptoms (cramps, hunger, bloating, embarrassment, weakness, dizziness, thirst, nausea, incontinence, and constipation) Increased insomnia in no MBP group
Ryan et al. [20]	MBP-oral magnesium citrate (39)	No MBP (39)	No difference in intraoperative visualization, bowel handling, or overall ease of the operation Same compliance, preoperative and postoperative patients' discomfort
Bakay and Aytakin [21]	MBP-oral NaP (NR)	No MBP (NR)	No difference in operative time
Mulayim and Karadag [12]	MBP-oral NaP (96)	MBP-enema NaP (92)	No difference in visualization of the surgical field, ease of bowel handling, and overall ease of surgery based on VAS score No benefit of MBP when removing large uteri or when operating on patients with a high BMI Preoperative overall discomfort score was better in the fasting-only group

In contrast to previous studies, Yang et al. (2011) compared efficiency of oral MBP vs enema MBP with NaP in advanced gynecologic laparoscopic procedures without very strict exclusion criteria. For instance, cases with obesity, history of previous surgery, and more complicated laparoscopic surgeries (such as excision of endometriosis with or without presacral neurectomy) were all included in the study. In accordance with previous literature, surgeons' assessment of surgical field showed no difference between the two groups (graded as excellent or good in 85% of patients in oral MBP and in 91% in enema group), resulting in similar surgical time and difficulty. Patients in the oral MBP group reported a significantly more unpleasant experience than those in the enema MBP group due to symptoms of abdominal swelling, nausea, and dizziness. Many of them stated that in case they had to undergo a surgical procedure again, they would choose a different preoperative bowel preparation type [11].

Preparation with enema use does not seem to be more effective when compared to fasting. In gynecologic laparoscopic surgery, using MBP in a form of either oral regimen or enema does not improve intraoperative visualization of surgical field, nor bowel handling. This also applies to cases where a large uterus is to be removed or to patients with higher BMI. Oppositely, overall discomfort of patients is anticipated to be much less, when fasting is the type of preoperative BP, compared to patients who undergo some form of MBP—oral or enema [12].

*Bowel Preparation before Vaginal Surgery.* To our knowledge, there are only four randomized control studies, investigating the use of BP prior to vaginal surgery (Table 2).

Ballard et al. studied surgeons' intraoperative assessment as well as patients' satisfaction. Women were divided into 2 groups, one receiving MBP with two saline enemas and the other not receiving anything per os after midnight before surgery. Women underwent vaginal prolapse surgery with

apical suspension and posterior colporrhaphy. Discomfort for women in the enema group was significantly higher, with hunger, weakness, abdominal swelling, and anal irritation being the most common causes, resulting in statistical difference in patients' complete satisfaction between the two groups (66% in saline enema group vs 94% in no MBP group,  $p < 0.001$ ). On the other hand, no difference was found regarding surgeons' assessment of bowel content and surgical site visualization [14].

Adelowo et al. compared the use of MBP (using oral magnesium citrate combined with sodium phosphate enema) to sodium phosphate enema alone, during minimally invasive pelvic reconstructive surgery. The MBP group reported greater overall discomfort and more side effects than the enema-only group. The quality of the surgical field was the same when appreciated in the conclusion of the operation, despite an initial advantage of the MBP group during port placement. Return of bowel function was the same in both groups (2–4 days, median 3 days) [13].

More recently (2019), a randomized single blind comparison of bowel preparation regimens for pelvic organ prolapse was conducted. Among 60 patients who received polyethylene glycol orally and 60 patients with no bowel preparation preoperatively, no difference was found regarding the cleansing of surgical field. Conversely, adverse effects were significantly higher in the group of patients with intestinal preparation while abdominal distention was reported by 22% and nausea by 8% of patients in the MBP group [13].

Moreover, the use of MBP in vaginal prolapse surgical treatment is being discouraged by another RCT by Tayyab et al. When patients' response was assessed postoperatively via evaluation of their symptoms (nausea, vomiting, and anal irritation), no difference was reported among patients treated preoperatively with saline enemas and those with regular diet. Therefore, they concluded that there is no need for preoperative hospitalization for the purpose of presurgical MBP [16].

#### 4. Discussion

The necessity of MBP in gynecologic surgery has been under investigation for the last decade, regarding its benefits, its possible side effects, and its effectiveness when compared to other types of preoperative bowel preparation. Many meta-analyses and reviews have been published regarding MBP's efficacy and possible side effects. Most authors set as a primary outcome of interest the quality of the surgical field, postoperative complications, and patient's comfort during the whole procedure, but they also set secondary objectives like the length of hospital stay (LOS) and economic costs [23]. The results are almost identical. Regardless of the type of procedure (laparoscopy, robotic, or vaginal surgery), routine administration of MPB seems to offer no advantage to any of the objectives mentioned above [24–26]. Surgical field visualization is irrelevant to the type of preoperative bowel preparation [25], bowel handling is the same whether MBP is used or not, surgical site infection rates are not affected by MBP use [26], LOS is not increased when MBP is omitted [9, 19], while patients' discomfort and adverse physiologic effects are significantly higher when oral laxatives are used [24, 25].

The most common MBP regimens include the use of laxatives which are administered either orally or rectally [24, 25]. Sodium phosphate (NaP) can be used as an enema or an oral preparation, while polyethene glycol is used orally. Other laxatives such as lactulose, sorbitol, glycerin, decorate, bisacodyl, or castor oil are scarcely prescribed [1].

The negative effects of bowel preparation include patient discomforts, such as postoperative pain, nausea, vomiting, abdominal distension, insomnia, weakness, and various physiologic changes [24, 25]. BP with bisacodyl and sodium phosphate resulted in severe dehydration which led to a significant decrease in exercise capacity and weight. Moreover, an increase in phosphate, urea serum concentrations and plasma osmolality combined with a significant drop in serum calcium and potassium was also observed [27]. Similar metabolic disturbances can result from the use of phosphate enema alone, as described by Mendoza et al. [28].

The use of mechanical bowel preparation is of little to no use in minimally invasive and vaginal gynecologic surgery. Hence, most surgical scientific organizations have issued guidelines against the use of MBP. WHO SSI pre-prevention guidelines, NICE guidelines of 2019, the guidelines of the American Society of Colon and Rectal Surgeons (ASCRS), and those of the Canadian Society of Colon and Rectal Surgeons (CSRS), the RCOG and the ACOG, advise against the sole use of mechanical bowel preparation [29–34]. To our knowledge, the use of MBP is not recommended by any scientific body, before minimally invasive or vaginal gynecologic surgery.

However, MBP may be acceptable only in combination with oral antibiotics bowel preparation. Recent evidence from a great number of studies has suggested that the combined use of MBP with OABP may have a beneficial effect on reducing postoperative complication rates (SSI, AL, and LOS) and eventually patients' morbidity. The effectiveness of combined BP is more obvious when applied preoperatively, in surgical operations with a high probability of intraluminal entry, resulting in less sterile surgical fields, such as in colorectal surgery and gynecologic procedures of increased complexity [2, 3, 29]. Therefore, some scientific societies that take these recent data into account have issued complimentary recommendations suggesting that MBP use in conjunction with OABP is the safer approach, at least in colorectal surgery [29, 31].

Unlike colorectal operations, in gynecologic and gynecologic oncology surgeries, bowel entry represents an uncommon phenomenon; however, bowel involvement either planned (bowel/colon resection) or iatrogenic (injury) can complicate either cases of advanced ovarian cancer, where cytoreductive surgery is required, or cases of severe endometriosis [4]. In most of the rest gynecologic cases, patients' morbidity remains low. Kafy et al. in an audit of 1792 hysterectomies for benign, nonobstetric reasons showed that the overall morbidity rate for laparoscopic approach was 9.4%, with only 0.4% being attributed to bowel injury, while in vaginal approach these percentages were 8.7% and 0%, respectively [35]. Readmission and overall infection rates were similarly low in both types of surgery (0.9% and 0.89% in minimally invasive cases, 1.3% and 0.9% in vaginal surgeries). In other reviews, the incidence of laparoscopy-induced gastrointestinal injury has even been reported to be as low as 0.13% and that of bowel perforation 0.22% [36].

## Conclusion

MBP is common not only in laparotomy but also in minimally invasive and vaginal surgery. Recently, the use of oral antibiotics for bowel preparation before surgery has emerged as an adjunct to MBP, aiming to reduce the high rates of postoperative septic complications and patients' morbidity with or without MBP, mostly in colorectal surgery. Nonetheless, they have not been widely accepted and have not been fully implemented in day-to-day practice. Despite the theoretical advantages of MBP, most available studies, either in gynecologic laparoscopy or in vaginal surgery, conclude that MBP does not reduce SSI rates, does not improve bowel manipulation, the field of view, and operating time, and does not affect patients' morbidity. On the other hand, MBP has a negative psychological and physiological impact on patients. Hence, MBP represents a point of debate for the scientific community that even led physicians and scientific committees to provide criteria and issue guidelines for excluding bowel preparation before specific types of surgery by highlighting the operations with minimal possibility of enteric participation. In particular, in the case of laparoscopic and vaginal gynecologic surgery, the risk of bowel intraluminal entry because of an injury or a planned enteric resection is minor. Consequently, the need for bowel anastomosis, SSI rate, and overall postoperative morbidity and mortality rate is also minimal. Therefore, according to recent evidence, preoperative bowel preparation of any type, mechanical or oral antibiotics, should be omitted before these surgical approaches.

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