

The Role of Mechanical Bowel Preparation in Gynecologic Laparoscopy

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ABSTRACT

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 gynecology, either for planned bowel surgery or in complex cases that are believed to be high risk for inadvertent bowel injury. As the trend in gynecologic surgery shifts toward more minimally invasive approaches, the complexity of cases being performed by laparoscopy and robotics continues to increase. In addition, laparoscopic surgical techniques have a different set of inherent risks and challenges as compared with open pelvic operations. This review summarizes the available data surrounding the use of mechanical bowel preparations, specifically with regard to gynecologic laparoscopy.

Keywords: Mechanical bowel preparation, Minimally invasive gynecological surgery, Laparoscopic surgery.

INTRODUCTION

Although therapeutic colonic cleansing has been documented as far back as 1500 BC in Egyptian medical writings,¹ the modern application of bowel preparation to elective surgery was refined as recently as the 1950s. Innovative surgeons of the time were searching for ways to decrease postoperative mortality given that the mortality rate for a primary colectomy in 1940 was estimated to be 30%.² Since then, 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 gynecology, either for planned bowel surgery or in complex cases that are thought to be high risk for inadvertent bowel injury. As the trend in gynecologic surgery shifts toward more minimally invasive approaches, the complexity of cases being performed by laparoscopy and robotics continues to increase. In addition, laparoscopic surgical techniques have a different set of inherent risks and challenges as compared with open pelvic operations. This review summarizes the available data surrounding the use of mechanical bowel preparations, specifically with regard to gynecologic laparoscopy.

Regimens for Bowel Preparation

Mechanical bowel preparation aims to decrease the volume of fecal content in the colon, which thereby decreases the total colony count of bacteria. Various regimens exist, consisting of diets such as low residue or clear liquid in the day(s) prior to surgery or cathartic pharmacotherapy that may be delivered orally or per rectum. Medications commonly used include emollients that soften the stool, allowing it to move more freely through the colon (e.g. ducosate); osmolar agents that cause colonic water retention [e.g. sodium or magnesium preparations,

polyethylene glycol (PEG), lactulose, sorbitol, glycerine]; and stimulants that increase intestinal peristalsis (e.g. casanthranol, senokot, bisacodyl and castor oil). Many of the regimens mentioned above are limited by patient tolerance, including issues, such as gastrointestinal distress, dehydration and electrolyte disturbances. In elderly patients or those with underlying renal dysfunction, mechanical bowel preparation may incur a significant risk of fluid shifts and severe electrolyte derangement.¹ Regarding choice of cathartic, sodium phosphate has been compared with PEG and found to be associated with lower complication rate, less intraoperative bowel spillage and improved patient tolerance.^{3,4}

Although not the primary focus of this review, the goal of antibiotic pretreatment is to decrease the concentration of bacteria in the colon. A landmark meta-analysis published in 1981 concluded that the evidence supporting antibiotic bowel preparation prior to colorectal surgery was such that further studies including no treatment control groups should be considered unethical.⁵ Antibiotic pretreatment can be accomplished via oral and/or parenteral administration; the relative merits of each approach remain an area of debate among colorectal surgeons. Preoperative oral antibiotics have been shown to produce a four to five log decrease in enteric bacterial concentration in resected colon,⁶ though proponents of parenteral administration emphasize the importance of achieving adequate systemic antibiotic levels while minimizing symptomatic gastrointestinal distress.⁷ Oral antibiotic bowel preparation regimens that were popularized in the 1970s included erythromycin and neomycin; however, many regimens have been subsequently studied without a consensus on the optimal agent. A recent Cochrane review on the topic concluded that antibiotics should be given prior to colorectal surgery and should include coverage for anaerobic as well as aerobic bacteria.⁸ This review suggests that a combination of oral and

intravenous antibiotics will likely give the best results, though timing of oral antibiotics remains unclear. Confounding the issue further, oral antibiotic preparation has not been studied in isolation from mechanical bowel preparation.

Mechanical Bowel Preparations: Controversy From General Surgery Literature

Since, first proposed by Sir William Halsted in 1887, the use of some form of mechanical bowel preparation to decrease infectious complications and anastomotic breakdown in elective colorectal surgery has been considered surgical dogma.⁹ Benefits of decreased fecal content of the bowel were thought to include minimized bacterial contamination, decreased passage of hard stool over newly formed anastomotic sites and facilitation of intraoperative bowel manipulation.¹⁰ Initial data supporting this practice were mainly observational; it was not until the 1970s that this practice was called into question when a randomized trial demonstrated no benefit of mechanical bowel preparation with regard to wound infection, peritonitis or death when used in elective colorectal surgery.¹¹ Data from emergency colorectal surgery in the 1980s further supported the view of bowel preparation as unnecessary. Traditionally, emergency surgery on unprepared bowel was treated with a diverting colostomy, extensive resection of ascending colon and/or intraoperative colonic lavage. Observations from emergency left-sided colorectal surgery, often performed due to obstructions caused by malignancy, supported the safety of primary anastomosis in these settings.¹² Further randomized trials in patients undergoing elective colorectal surgery suggested increased morbidity when mechanical bowel preparation was used, including increased postoperative infections, extraabdominal complications and longer hospital stays.¹⁰ Suggested mechanisms for the increased infectious morbidity associated with mechanical bowel preparations include enhanced bacterial translocation across the lumen and increased bowel inflammation.¹³⁻¹⁵ It has also been reported that inadequate mechanical bowel preparation results in higher incidence of liquid bowel content with a corresponding increase in peritoneal spillage intraoperatively.¹⁶ The 2009 updated Cochrane review concluded that prophylactic mechanical bowel preparations have no proven benefit and should be abandoned in most cases.⁸ Potential situations where bowel preparations may remain useful include those wherein an intraoperative colonoscopy is performed. The Cochrane review further comments that future research on this topic is needed, specifically with well-designed trials that include allocation concealment, stratification of colon versus rectal surgery, comments on history of radiation and inclusion of laparoscopic surgery. Despite the large pool of data supporting the omission of mechanical bowel preparations and changing guidelines, clinical practice has been slow to change; a 2005 survey of Northern European surgeons found that between 50 and 95% continue to use preoperative bowel preparation.¹⁷

Mechanical Bowel Preparations in Gynecologic Laparoscopy

Although the majority of the evidence regarding bowel preparations is found in colorectal surgery literature, studies have also been performed specifically targeting a gynecologic population. With regard to gynecologic laparoscopy in particular, one proposed role for bowel preparation includes cases where bowel resection is planned or thought to be high risk for inadvertent bowel injury (e.g. severe adhesive disease, endometriosis, previously irradiated operative field, malignancy). Bowel injury is a rare complication of laparoscopy; the incidence has been reported at 0.13% by a 2004 literature review.¹⁸ Compounding this fact that only a limited number of gynecologic cases that will result in bowel injury, the data from colorectal surgery support abandoning routine mechanical bowel preparation.

In addition, it has been proposed that clearing of bowel contents may aid in visualization and handling of intestines during laparoscopic surgery. In a randomized trial, Muzii et al studied the effects of bowel preparation with oral sodium phosphate solution in patients undergoing laparoscopy for benign gynecologic indication; the authors did not find any advantage regarding preparation of surgical field, operative time, intra or postoperative complications or length of stay.¹⁹ Conversely, the mechanical bowel preparation group reported significantly greater preoperative discomfort. Another randomized study compared mechanical bowel preparation to a 7-day minimal residue diet in patients undergoing laparoscopy for benign gynecologic disease.²⁰ The precolonoscopy, low-residue diet demonstrated minimal colonic fecal residue and may potentially decrease colonic gaseous distension. In the study mentioned, both groups were found to have similar surgical field exposure; however, the low-fiber diet was better tolerated.

SUMMARY AND RECOMMENDATION

An emerging body of evidence suggests lack of benefit—and potential for harm—with routine use of mechanical bowel preparation in colorectal surgery. Despite a paucity of literature specific to gynecologic surgery, it is reasonable to extrapolate from the general surgery data a recommendation against mechanical bowel preparation for the indication of decreasing infectious complications related to bowel injury or resection.²¹ Antibiotic bowel preparation, however, has been proven beneficial in colorectal surgery and can reasonably be used in complicated gynecologic cases at high risk for bowel involvement. A caveat to this recommendation is the importance of understanding the clinical practices of consulting colorectal surgeons at individual institutions. Should an unexpected bowel injury occur in a patient who did not undergo preoperative mechanical bowel preparation and who requires the services of a surgical consultant to assist with repair? The

decision whether to proceed with primary anastomosis *versus* fecal diversion may be taken out of the hands of the gynecologist. Despite recommendations and data supporting the safety of primary anastomosis on unprepared bowel, clinical practice patterns among surgeons vary greatly. In situations where the patient is thought to be at high-risk for inadvertent bowel injury, it may be prudent to perform a mechanical bowel preparation to avoid the possibility of fecal diversion, depending on the pervasive local practice patterns of consulting surgeons. It may also be a good idea to have a discussion with the local team of surgeons to discuss what influence, if any, the lack of a mechanical bowel preparation might have on their surgical management of an inadvertent bowel injury.

A novel role for bowel preparation in pelvic laparoscopic surgery is the evacuation of intestinal contents to allow for a clearer operative field. Based on a single, randomized, controlled trial, there does not appear to be any advantage of mechanical bowel preparation on surgeon perception of appropriateness of surgical field.¹⁹ As the field of minimally invasive gynecologic surgery continues to evolve and encompass more complex surgical techniques, further research is needed to better define optimal pre and intraoperative management. As suggested by the Cochrane review, well-designed randomized studies regarding mechanical bowel preparation in laparoscopy are needed, regarding both oncologic and benign gynecologic indications.

REFERENCES

1. Botha MH. Mechanical bowel preparation in gynaecological surgery—are we doing more harm than good? *S Afr Med J* 2007;97:1040, 1042-43.
2. Leo WA, Von Riesen VL, Roberts GG, Schloerb PR. Twenty-four hours preparation of the large bowel for surgery using neomycin-sulfathalidine or neomycin-oxytetracycline: A comparative evaluation. *Ann Surg* 1958;147:359-65.
3. Itani KM, Wilson SE, Awad SS, et al. Polyethylene glycol versus sodium phosphate mechanical bowel preparation in elective colorectal surgery. *Am J Surg* 2007;193:190-94.
4. Chaleoykitti B. Comparative study between polyethylene glycol and sodium phosphate solution in elective colorectal surgery. *J Med Assoc Thai* 2002;85:92-96.
5. Baum ML, Anish DS, Chalmers TC, et al. A survey of clinical trials of antibiotic prophylaxis in colon surgery: Evidence against further use of no-treatment controls. *N Engl J Med* 1981;305:795-99.
6. Bartlett JG, Condon RE, Gorbach SL, et al. Veterans administration cooperative study on bowel preparation for elective colorectal operations: Impact of oral antibiotic regimen on colonic flora, wound irrigation cultures, and bacteriology of septic complications. *Ann Surg* 1978;188:249-54.
7. Espin-Basany E, Sanchez-Garcia JL, Lopez-Cano M, et al. Prospective, randomised study on antibiotic prophylaxis in colorectal surgery. Is it really necessary to use oral antibiotics? *Int J Colorectal Dis* 2005;20:542-46.
8. Guenaga KK, Matos D, Wille-Jørgensen P. Mechanical bowel preparation for elective colorectal surgery. *Cochrane Database Syst Rev* 2009;1 CD001544.
9. Halsted WS. Circular suture of the intestine: An experimental study. *Am J Med Sci* 1887;94:436-61.
10. 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;92:409-14.
11. Hughes ES. Asepsis in large-bowel surgery. *Ann R Coll Surg Engl* 1972;51:347-56.
12. Dorudi S, Wilson NM, Heddle RM. Primary restorative colectomy in malignant left-sided large bowel obstruction. *Ann R Coll Surg Engl* 1990;72:393-95.
13. Poole GV. Spontaneous bacterial peritonitis during bowel preparation: An example of clinical translocation. *South Med J* 1991;84:1412-13.
14. Kale TI, Kuzu MA, Tekeli A, et al. Aggressive bowel preparation does not enhance bacterial translocation, provided the mucosal barrier is not disrupted: A prospective, randomized study. *Dis Colon Rectum* 1998;41:636-41.
15. Bucher P, Gervaz P, Egger JF, et al. Morphologic alterations associated with mechanical bowel preparation before elective colorectal surgery: A randomized trial. *Dis Colon Rectum* 2006;49:109-12.
16. Mahajna A, Krausz M, Rosin D, et al. Bowel preparation is associated with spillage of bowel contents in colorectal surgery. *Dis Colon Rectum* 2005;48:1626-31.
17. Lassen K, Hannemann P, Ljungqvist O, et al. Patterns in current preoperative practice: Survey of colorectal surgeons in five Northern European countries. *BMJ* 2005;330:1420-21.
18. van der Voort M, Heijnsdijk EA, Gouma DJ. Bowel injury as a complication of laparoscopy. *Br J Surg* 2004;91:1253-58.
19. Muzii L, Bellati F, Zullo MA, et al. Mechanical bowel preparation before gynecologic laparoscopy: A randomized, single-blind, controlled trial. *Fertil Steril* 2006;85:689-93.
20. Lijoi D, Ferrero S, Mistrangelo E, et al. Bowel preparation before laparoscopic gynaecological surgery in benign conditions using a 1 week low-fibre diet: A surgeon blind, randomized and controlled trial. *Arch Gynecol Obstet* 2009;280:713-18.
21. Gadducci A, Cosio S, Genazzani AR. The perioperative management of patients with gynaecological cancer undergoing major surgery: A debated clinical challenge. *Crit Rev Oncol Hematol* 2010;73:126-40.