Original Article

Brief Overview about Preoperative bowel preparation for gynecological oncology surgery

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DOI: 10.47750/pnr.2023.14.03.204

Abstract

Background: Gynecologycial Malignancies are specialized field of medicine that focuses on cancers of the female reproductive system, including ovarian cancer, uterine cancer, vaginal cancer, cervical cancer, and vulvar cancer. As specialists, they have extensive training in the diagnosis and treatment of these cancers. Bowel preparation has become an established practice before abdominal and gynecological surgeries. Most general surgeons would use both chemical bowel preparation and mechanical bowel preparation (MBP) before bowel surgery. In a survey of the practices of surgeons about the use of oral antibiotics in preoperative bowel preparation had the most disparate responses with 51% of the surgeons responding that the oral antibiotics were of doubtful or no use. However, despite their doubts, 75% of the surgeons routinely used oral antibiotic preparations, including 82% of those who questioned its usefulness

Keywords: Preoperative bowel preparation, gynecological oncology surgery

INTRODUCTION

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I.CERVICAL CANCER:

Cervical cancer is a cancer arising from the cervix. Cervical cancer, though largely preventable, is the second most common female cancer internationally and a leading cause of cancer deaths among females in the developing countries. Cervical cancer is the fourth most frequent cancer in women with an estimated 604 000 new cases in 2020. Of the estimated 342 000 deaths from cervical cancer in 2020, about 90% of these occur in low- and middle-income countries **(2)**

II.ENDOMETRIAL CANCER:

Endometrial cancer is cancer of the endometrium, which is the lining of the uterus. It is the most common type of cancer that affects the female reproductive organs. The most common type of endometrial cancer (type 1) grows slowly. It most often is found only inside the uterus. Type 2 is less common. It grows more rapidly and tends to spread to other parts of the body. **(3)**

III.OVARIAN CANCER:

Ovarian cancer is a cancer that forms in or on an ovary. It results in abnormal cells that have the ability to invade or spread to other parts of the body. When this process begins, there may be no or only vague symptoms. Symptoms become more noticeable as the cancer progresses. These symptoms may include bloating, pelvic pain, abdominal swelling, and loss of appetite, among others. Common areas to which the cancer may spread include the lining of the abdomen, lymph nodes, lungs, and liver **(4)**

Preoperative bowel preparation for gynecological oncology surgery

Bowel preparation has become an established practice before abdominal and gynecological surgeries. Most general surgeons would use both chemical bowel preparation and mechanical bowel preparation (MBP) before bowel surgery. In a survey of the practices of surgeons about the use of oral antibiotics in preoperative bowel preparation had the most disparate responses with 51% of the surgeons responding that the oral antibiotics were of doubtful or no use. However, despite their doubts, 75% of the surgeons routinely used oral antibiotic preparations, including 82% of those who questioned its usefulness **(5).**

I.CHEMICAL PREPARATIONS (PROPHYLAXIS ANTIBIOTICS):

Postoperative infections occur as the consequence of complex interactions between the bacteria reaching the bowel intraoperative, and local and systemic immunity of the host. The number of inoculated bacteria is directly associated with the risk of postoperative infections. The factors such as prolonged postoperative hospitalization and overuse of antibiotics increase the risk of bacterial colonization. Provision of optimal local immunity to infection is primarily a surgical task. Various factors, such as the presence of blood, foreign bodies, ischemia, or necrotic tissue in the surgical field, can have an adverse impact on local patient defense and increase the risk of infection. By way of meticulous surgical technique, we can avoid many of these factors. A principal benefit related to preoperative use of antibiotics is the elimination or prevention of growth of endogenous microorganisms (bacterial flora), which can induce infection in the surgical field **(6).**

In gynecological operations, antibiotic prophylaxis is used to pursue the decrease of peritoneal and wound contamination by the intra-luminal content in case of bowel opening during the surgical intervention, and it also reduces infections other than those at the surgical field. In case of intra-abdominal spillage of bowel content, more than 400 different species of bacteria contaminate the peritoneal cavity. If infection occurs, it will be polymicrobial, with *Escherichia coli* and *Bacteroides fragilis* being the most frequently isolated agents. Prophylactic antibiotics significantly reduce concentrations of bacteria in the intra-luminal colon content. In a review of 26 trials on colon surgery with antibiotic prophylaxis compared with no antibiotic treatment reported that there was a 14% reduction for infection rates (22% versus 36%) and a 6.7% reduction for death rates (11.2% versus 4.5%). Antibiotics should be used when there is an elevated probability of microbial contamination during gynecologic surgery (e.g., surgical transection of the vagina) and the incidence of postoperative infection is high **(7).**

Principles of chemical preparations:

The most important principle is that the chosen antibiotic should be effective against the pathogens most commonly responsible for infection after gynecological operations, but not an agent used routinely for treatment of serious infectious complications. Adequate antibiotic concentration has to be present in the tissues in the beginning and during the surgery. In addition, the antibiotic should be of low toxicity and able to achieve appropriate tissue **(8)**

Types of chemical preparations:

1) Parental antibiotics:

A maximum concentration of antibiotic in the pelvic tissues is reached 20 minutes after an intravenous (IV) administration, and after two hours it markedly drops. In time-consuming interventions intramuscular administration of antibiotics is preferred. If the operation is going to take more than 3 hours, administration of antibiotics should be repeated. IV use of antibiotics is an optimal way to provide an adequate level of presence in the tissues for most gynecological operations. Regarding intravenous antibiotics for colorectal procedures: "A single dose of second-generation cephalosporin with both aerobic and anaerobic activities (cefoxitin or cefotetan) or cefazolin plus metronidazole is recommended for colon procedures. If there is increasing resistance to first and second-generation cephalosporins among gram-negative isolates from surgical site, it is recommended to give a single dose of ceftriaxone plus metronidazole over routine use of carbapenems. An alternative regimen is ampicillin–sulbactam. Prophylactic use of antibiotics has been demonstrated to be more successful for vaginal compared to abdominal operations. A recommended regimen for patients undergoing vaginal hysterectomy, abdominal or radical hysterectomy consists of a dose of IV cefazolin (1 g) or cefotetan (1 g) at the induction of anesthesia, or aminoglycosides with metronidazole **(9)**

Patients who receive prophylactic antibiotics within a two hour "window" period before the initial incision have lower rates of surgical site infection than patients who receive them either too early or postoperatively**.** Cephalosporins (e.g. cefazolin 1 or 2 g, cefoxitin 1 to 2 g, cefotetan 1 to 2 g) are the drugs of choice for prophylaxis in hysterectomy or urogynecological procedures because of their low incidence of allergy and side effects, broad antibacterial spectrum, long half-life, and low cost. It is usually given as a single IV dose 30 minutes prior to the incision and should be repeated to maintain tissue levels if the procedure extends beyond four hours or if blood loss is greater than 1500 ml. Regimens that continue prophylaxis postoperatively do not confer any additional benefit and are not recommended. Ampicillin-sulbactam is an option in women who also require endocarditis prophylaxis. Clindamycin is mainly active against anaerobic bacteria, including B. fragilis, streptococci, and staphylococci, but not against enterococci and enterobacteria. Clindamycin or metronidazole monotherapy are no longer recommended for perioperative antibiotic prophylaxis by the Centers for Medicare Services in Collaboration with the Centers for Disease Control (CDC) and Prevention or by ACOG **(10).**

2) *Oral antibiotics:*

The role of oral antibiotics in reduction of infection is not clear. Colorectal resections have a higher infection rate than other elective abdominal operations because of the high bacterial load present within the colon lumen, estimated to be 10 colony-forming units per gram of stool. Neomycin sufficiently suppressed the fecal flora for intraperitoneal bowel anastomosis to be undertaken with safety. No instance of staphylococcal enterocolitis followed the use of neomycin in this small series; and, no such complication has been reported in America, where the drug has been in use on a wider scale for a considerable period. Similarly, intestinal moniliasis, which also may complicate oral antibiotic therapy, has not been reported as following neomycin therapy **(11).**

The indications for prophylactic antibiotics in elective bowel surgery are still debated, but results of studies using metronidazole in addition to kanamycin, neomycin or phthalylsulphathiazole provide strong evidence that anaerobic bacteria particularly (Bacteroides species) are the major contributors to intra-abdominal and wound infection after colon surgery. In the prevention of anaerobic infection in gynecological surgery, 1g orally as a single dose followed when possible by 200mg orally,

3 times daily for up to 7 days after surgery is the recommended regimen. In elective colonic surgery, metronidazole has been successfully used when given alone (1 g orally as single dose, 200mg 8 hourly thereafter when possible and 1 g rectally 8 hourly during periods when oral medication is not possible, for a total of 7 days' treatment) and when given concomitantly with kanamycin or phthalylsulphathiazole **(11)**

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Neomycin is an aminoglycoside antibiotic that displays bactericidal activity against gram-negative aerobic bacilli and some anaerobic bacilli where resistance has not yet arisen. It is generally not effective against gram-positive bacilli and anaerobic gram-negative bacilli. It seems to be effective in reducing infectious complications after elective major surgeries without refuelling the old debate of whether orally administered antibiotics are useful in addition to iv prophylaxis ***(11).***

Secnidazole is a nitroimidazole anti-infective. Effectiveness in the treatment of dientamoebiasis has been reported. It has also been tested against Atopobium vaginae. In many countries, secnidazole is approved for the treatment of bacterial vaginosis and trichomoniasis in adult women. Its role in bowel preparation of patients undergoing major gynaecological surgery is unclear either alone or in combination with antibiotics as Neomycin ***(11).***

II.MECHANICAL BOWEL PREPARATIONS (MBPs):

Rationale for bowel preparation:

MBP is used to obtain two main goals: first, the removal of bulky intraluminal contents to improve both surgical field visualization and handling of the bowel and the second is to decrease of peritoneal and wound contamination by the intraluminal content in case of bowel opening. The former argument (better field visualization and bowel handling) would hold true for any intra-abdominal surgical procedure, both in general and gynecological surgery, whereas the latter (minor intra-peritoneal and wound contamination) would stand only in case of bowel opening during surgery as, for example, in colorectal surgery. In gynecological surgery, bowel opening can be anticipated in case of advanced or recurrent cancer, radiotherapy complications and some benign gynecological conditions such as severe endometriosis, severe adhesions, pelvic abscess and ovarian remnant syndrome. In all other cases, unexpected bowel surgery has a low incidence and only the first argument should be considered **(12).**

There are several potential or perceived advantages of MBPs. Historically, the possibility of having the high bacterial load content of feces coming in contact with a newly performed anastomosis led to the construction of a defunctioning stoma when colon was not prepared. MBP was also thought to clear the bowel lumen of stool and leave only gas. Theoretically, this would decrease the intra-luminal pressure of hard, potentially impacted stool, and reduce ischemia at the new anastomosis. Moreover, an empty colon may be easier to manipulate than a colon full of stool. In addition, certainly, when the surgeon knows he or she needs to rely on palpation to locate the lesion, having an empty colon is an advantage. MBP reduces the total amount of intestinal bacteria, by reducing the stool content, but it does not reduce the concentration of bacteria in the intraluminal liquid content. The efficacy of MBP in reducing the rate of intraperitoneal infection in case of bowel content spillage is not clear-cut. The practice of MBP administration, regarding the necessity and benefits, has been challenged on the basis of uncontrolled reports and also of randomized clinical trials **(13).**

Types of mechanical bowel preparations:

MBPs are preparations that are taken by mouth to achieve clearance of the colonic contents. Although enemas and diet restrictions are also a mechanically driven way of lower intestinal cleansing, they are usually not classified as MBPs. There are several classes of cleansing methods that include osmotic agents, stimulant laxatives, and regimens that involve a combination of osmotic and laxatives. Osmotic agents may be classified into absorbed and non-absorbed or isosmotic, hypoosmotic, hyperosmotic and combination agents. Further classification of MBP into high- and low-volume preparations is also possible. High-volume denotes the preparation requires at least 4L of cathartic consumption, while low-volume preparations require smaller volumes of cathartic consumption **(14).**

Adjunctive measures:

1) Laxatives:

Stimulant laxative agents cause bowel wall contraction that aids in evacuation. In trials that use cathartic agents alone, only 75% of patients achieve adequate cleansing. When combined with enemas, dietary restrictions, or osmotic agents, the use of these agents, especially when initiated 1 to 2 days before the procedure, are effective in achieving adequate cleansing of feces from the bowel lumen. Senna is a stimulant laxative that contains anthraquinone derivatives (glycosides and sennosides) that are activated by colonic bacteria. The activated derivatives have a direct effect on intestinal mucosa, increasing the rate of colonic motility, enhancing colonic transit, and inhibiting water and electrolyte secretion. Senna has been used as an adjunct to PEG-ELS regimens in a manner similar to that of bisacodyl. No differences were found between Senna and bisacodyl when used as an adjunct in combination with PEG-ELS **(15).**

2) Flavoring*:*

There have been many attempts to improve the flavor of PEG-ELS. As a result, PEG-ELS are available in multiple flavors. Gatorade, Crystal Light, and carbohydrate electrolyte solutions have been used to improve palatability in non-electrolyte balanced PEG solutions; however, improved flavor does not necessarily equate to improved tolerance. Care must be taken to avoid adding substrates to the preparation that can metabolize into explosive gases or significantly alter water and electrolyte

absorption. Sugar-free menthol candy drops may improve palatability and tolerability of a split-dose PEG-ELS preparations **(16).**

3) Nasogastric tube administration of colonic preparations:

NG tubes have been used to instill colonic preparations, primarily PEG- ELS solutions, in both children and adults. Purge preparations (rapid and high-volume) for patients with lower GI bleeding and urgent bowel preparation may require the placement and use of a NG tube. In addition to the potential adverse events related to placement of the NG tube, case reports have demonstrated the potential for severe, life threatening adverse events, such as aspiration. Adjunctive use of prokinetic and anti-emetic agents as well as avoidance of over rapid installation of bowel preparation may make this route of administration more tolerable **(17).**

4) Metoclopramide:

Metoclopramide is a dopamine antagonist gastroprokinetic that increases the amplitude of gastric contraction and increases peristalsis of the duodenum and jejunum, but does not change colonic motility. In one study, Metoclopramide (5-10mg orally) used as an adjunct to PEG-ELS reduced nausea and bloating, but did not improve colonic cleansing. However, a second study revealed no advantage with either patient tolerance or colonic cleansing. Metoclopramide is not recommended as an adjunct to oral bowel preparation **(18).**

5) Simethicone:

Simethicone promotes the clearance of excessive gas in the GI tract that reduces bloating, abdominal discomfort, and abdominal pain and improves visualization in the GI tract. There have been several studies investigating the addition of Simethicone to bowel preparation regimens. Overall, Simethicone does not significantly change the quality of the bowel preparation; however, it does reduce the number of adherent bubbles present, which may enhance colonic visualization **(19)**

III.SPECIAL CONSIDERATIONS:

Inadequate bowel preparation:

Inadequate bowel preparation can result in missed lesions, canceled procedures, increased procedural time, increased costs, and a potential increase in adverse event rates. In patients with fair bowel preparations, 28% to 42% had adenomas found when the examination was repeated within 3 years, including up to 27% with advanced adenomas. It has been estimated that intraprocedural cleansing accounts for 17% of total bowel preparation procedural time. One study that examined possible causes of poor preparation found that less than 20% of patients with an inadequate colonic preparation reported a failure to adequately follow preparation instructions. The most important predictor of inadequate preparation is a previous inadequate preparation **(20).**

IV.ENEMAS AS PREOPERATIVE PREPARATION:

Enemas for rectal cleansing have been commonly used as part of MBP for colorectal procedures. Options for enemas include NaP, glycerin, or saline solutions. While in the United States they may be self-administered at home, in Europe, they are more commonly administered in the hospital, 2 to 4 hours before surgery. The theoretical benefit of rectal cleansing with enema solutions is that the reduction of fecal matter in the rectal vault prevents extrusion of bowel contents and mechanical obstruction during insertion of the stapling devices for anastomosis creation. This may be especially useful in rectal surgery, and it is commonly reported that physicians perform an on- table saline rectal washout before such procedures **(21).**

V.DIETARY PREPARATIONS:

A review of studies in bowel preparation for colonoscopy recently challenged the importance of traditional dietary restrictions for adequate bowel preparation. The consumption of low-residue liquid supplements, low-residue meals, and even regular diets until the evening before surgery have been shown to be equivalent or better than the traditional 24-hour clear liquid diet before colonoscopy. In these studies, various PEG solutions were used for MBP and many investigators attributed the improved results of the relaxed dietary regimens to the improved ability for patients to tolerate and complete the full liquid prep. In one study, increasing consumption of high-residue food before colonoscopy was a predictor of poor colon preparation, indicating that there may be a limit before detrimental effects are seen. The current evidence from studies comparing MBP with no MBP in elective colorectal procedures also suggests that a regular diet may be safely maintained through the day before surgery. Easing the dietary restrictions during preparation for colon surgery may result in equivalent or better bowel preparation before surgery when combined with PEG solution **(22).**

REFERENCES

1. Arnold, A., Aitchison, L. P., & Abbott, J. (2015). Preoperative mechanical bowel preparation for abdominal, laparoscopic, and vaginal surgery: a systematic review. *Journal of minimally invasive gynecology*, *22*(5), 737-752.
2. Jassim, G., Obeid, A., & Al Nasheet, H. A. (2018). Knowledge, attitudes, and practices regarding cervical cancer and screening among women visiting primary health care Centres in Bahrain. *BMC public health*, *18*(1), 1-6.
3. Galaal, K., Donkers, H., Bryant, A., & Lopes, A. D. (2018). Laparoscopy versus laparotomy for the management of early stage endometrial cancer. Cochrane Database of Systematic Reviews, (10).
4. Ruddon, Raymond W. Cancer biology (4th ed.). Oxford: Oxford University, 2017; Press. p. 223. ISBN 9780195175431. Archived from the original on 2015-09-15. Cite uses deprecated parameter |deadurl=(help).
5. Diakosavvas, M., Thomakos, N., Haidopoulos, D., Liontos, M., & Rodolakis, A. (2020). Controversies in preoperative bowel preparation in gynecologic and gynecologic oncology surgery: a review of the literature. *Archives of Gynecology and Obstetrics*, *302*(5), 1049-1061.
6. Kolasiński, W. (2019). Surgical site infections–review of current knowledge, methods of prevention. *Polish Journal of Surgery*, *91*, 41-47.

7. Hodges, K. R., Davis, B. R., & Swaim, L. S. (2014). Prevention and management of hysterectomy complications. *Clinical obstetrics and gynecology*, *57*(1), 43-57.
8. Sadahiro, S., Suzuki, T., Tanaka, A., Okada, K., Kamata, H., Ozaki, T., & Koga, Y. (2014). Comparison between oral antibiotics and probiotics as bowel preparation for elective colon cancer surgery to prevent infection: prospective randomized trial. *Surgery*, *155*(3), 493-503.
9. Gupta, B., & Rajaram, S. (2018). Preparation for Vaginal Hysterectomy: History, Preoperative Assessment, Operative Set-up, Table, Antibiotics. In *Hysterectomy* (pp. 1363-1372). Springer, Cham.
10. Dumville, J. C., Owens, G. L., Crosbie, E. J., Peinemann, F., & Liu, Z. (2015). Negative pressure wound therapy for treating surgical wounds healing by secondary intention. Cochrane Database of Systematic Reviews, (6)..
11. Murray, A. C. A., & Kiran, R. P. (2016). Bowel preparation: are antibiotics necessary for colorectal surgery?. *Advances in Surgery*, *50*(1), 49-66.
12. Rollins, K. E., Javanmard-Emamghissi, H., & Lobo, D. N. (2018). Impact of mechanical bowel preparation in elective colorectal surgery: a meta-analysis. *World journal of gastroenterology*, *24*(4), 519.
13. Koskenvuo, L., Lehtonen, T., Koskensalo, S., Rasilainen, S., Klintrup, K., Ehrlich, A., ... & Sallinen, V. (2019). Mechanical and oral antibiotic bowel preparation versus no bowel preparation for elective colectomy (MOBILE): a multicentre, randomised, parallel, single-blinded trial. *The Lancet*, *394*(10201), 840-848.
14. Saltzman, J. R., Cash, B. D., Pasha, S. F., Early, D. S., Muthusamy, V. R., Khashab, M. A., ... & Acosta, R. D. (2015). Bowel preparation before colonoscopy. *Gastrointestinal endoscopy*, *81*(4), 781-794.
15. Vilanova-Sanchez, A., Gasior, A. C., Toocheck, N., Weaver, L., Wood, R. J., Reck, C. A., ... & Levitt, M. A. (2018). Are Senna based laxatives safe when used as long term treatment for constipation in children?. *Journal of pediatric surgery*, *53*(4), 722-727.
16. Millien, V. O., & Mansour, N. M. (2020). Bowel preparation for colonoscopy in 2020: a look at the past, present, and future. *Current Gastroenterology Reports*, *22*(6), 1-9.
17. Gustafsson, U. O., Scott, M. J., Hubner, M., Nygren, J., Demartines, N., Francis, N., ... & Ljungqvist, O. (2019). Guidelines for perioperative care in elective colorectal surgery: Enhanced Recovery After Surgery (ERAS®) Society recommendations: 2018. *World journal of surgery*, *43*(3), 659-695.
18. Saltzman, J. R., Cash, B. D., Pasha, S. F., Early, D. S., Muthusamy, V. R., Khashab, M. A., ... & Acosta, R. D. (2015). Bowel preparation before colonoscopy. *Gastrointestinal endoscopy*, *81*(4), 781-794.
19. Rondonotti, E., Spada, C., Adler, S., May, A., Despott, E. J., Koulaouzidis, A., ... & Pennazio, M. (2018). Small-bowel capsule endoscopy and device-assisted enteroscopy for diagnosis and treatment of small-bowel disorders: European Society of Gastrointestinal Endoscopy (ESGE) Technical Review. *Endoscopy*, *50*(04), 423-446.
20. MacPhail, M. E., Hardacker, K. A., Tiwari, A., Vemulapalli, K. C., & Rex, D. K. (2015). Intraprocedural cleansing work during colonoscopy and achievable rates of adequate preparation in an open-access endoscopy unit. *Gastrointestinal Endoscopy*, *81*(3), 525-530.
21. Pittet, O., Nocito, A., Balke, H., Duvoisin, C., Clavien, P. A., Demartines, N., & Hahnloser, D. (2015). Rectal enema is an alternative to full mechanical bowel preparation for primary rectal cancer surgery. *Colorectal Disease*, *17*(11), 1007-1010.
22. Lee, D., Albenberg, L., Compher, C., Baldassano, R., Piccoli, D., Lewis, J. D., & Wu, G. D. (2015). Diet in the pathogenesis and treatment of inflammatory bowel diseases. *Gastroenterology*, *148*(6), 1087-1106