The Egyptian Journal of Hospital Medicine (April 2025) Vol. 99, Page 2350-2355

New Protocols in Preoperative Bowel Preparation before Major Gynecological Surgeries

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ABSTRACT

Background: It is currently widely acknowledged that several oral or parenteral antibiotics with both aerobic and anaerobic activity, either alone or in combination, along with efficient mechanical preparation, constitute an effective bowel preparation. Numerous antibiotic regimens have been suggested and investigated in clinical settings; some have proven more effective than others.

Objective: To find new protocols in preoperative bowel preparation before major gynecological surgeries.

Methods: This clinical trial study included 90 patients underwent major gynecological operations in time of the study. The patients in this current study were divided into three groups: Group A: included 30 cases (Neomycin + metronidazole) by oral route. Group B: included 30 cases (Clindamycin + metronidazole) by oral route. Group C: included 30 cases (metronidazole by oral route + Cephalosporins by parenteral route).

Results: In our study, mean postoperative length of stay was comparable among our study groups. Bowel injury, sepsis, time to pass stool and death had no significant differences among our study groups. Preoperative discomfort showed significant differences among groups ($p<0.001$). Bowel injury, sepsis and death were common among group B (Clindamycin + metronidazole). Our study results found that group C (Cephalosporins + metronidazole) had the highest rate of surgical site infection with statistical insignificant difference.

Conclusion: We recommend full bowel preparation, with both oral antibiotics and a mechanical bowel preparation, before the major gynecological surgeries.

Keywords: Bowel Preparation, Gynecological Surgeries, Preoperative Preparation.

INTRODUCTION

Surgery has been described as "benign violence," a term that is fitting for the intentional and planned injury of a human body, even when the objective of cure disease is involved [(1)]. In fact, from a biological perspective, tissue damage during surgery results from traumatic injury; although this form of injury may be required and advantageous, the body does not distinguish between trauma from a surgeon's blade and other types of traumas. Actually, research has indicated that patients experience significant physical stress both before and after surgery [(2)].

Twenty-five years ago, it was determined the actual function that facultative and anaerobic bacteria in the colon play in the etiology of infectious problems after colorectal surgery. The intestinal bacterial load and the risk of recurrent infections were both markedly reduced when antibiotics that are effective against both bacterial species were given orally as a part of the preoperative bowel preparation [(3)]. It is now widely acknowledged that a variety of parenteral or oral antibiotics, either alone or in combination, with both aerobic and anaerobic activities, along with an efficient mechanical preparation, constitute an effective bowel preparation [(4)].

Clinical trials have been conducted on a wide range of antibiotic regimens, some of which have had better outcomes than others. In modern practice, oral antibiotics are most frequently used in conjunction with preoperative parenteral antibiotics, even though oral antibiotics were the only ones that were successful at first. In order to lower the gross intraluminal contents during surgical procedures, a variety of mechanical preparations have also been employed [(3)].

Aim of the work: To find new protocols in preoperative bowel preparation before major gynecological surgeries.

PATIENTS AND METHODS

This was a clinical trial study that was conducted at the Obstetrics and Gynecology Departments in Al-Glaa and EL-Sahel Teaching Hospitals, Cairo from March 2024 to February 2025. The study Included 90 cases 30 in each group of tradition and new protocols .Traditional protocol use oral preparation while new protocol add parenteral drug.

Inclusion criteria: Patients undergo major gynecological operations.

Exclusion criteria:

- Patients undergo minor surgery.
- Patients undergo laparoscopic surgery.

The patients in this current study were divided into three groups randomly assigned using a computer-generated randomization sequence through Excel program. Allocation were concealed using sequentially

Received: 08/01/2025
Accepted: 10/03/2025

numbered, opaque, sealed envelopes (SNOSE) to prevent selection bias.

- **Group A**: included 30 cases (Neomycin + metronidazole) by oral route.
- **Group B**: included 30 cases (Clindamycin + metronidazole) by oral route
- **Group C**: included 30 cases (metronidazole by oral route + third generation Cephalosporins (ceftriaxone) 1gm by parenteral route).

METHODS

- Full history taking.
- General examination: including vital sign (pulse, blood pressure and temperature) and examination of head, Neck, chest, heart and limbs.
- Abdominal examination: organomegaly, mass and ascites.
- Investigations such as complete blood count, coagulation profile, liver function tests, kidney function tests, serum Na, and random blood sugar.

Protocols for bowel preparation:

The first protocol:

Two days before surgery:

- liquid or low residual diet.
- Regular mechanical bowel preparations (MBP); lactulose every 8 hours (one spoon).

Antibiotic preparation:

- Neomycin 500mg tablets every 8 hours+ metronidazole 500mg tablet every 8 hours (oral).

One day before surgery:

- NPO.
- I.V Fluids.
- MBP using lactulose every 8 hours (one spoon) plus enema every 12 hours.

The second protocol:

Two days before surgery:

- Liquid or low-residual diet.
- MBP using Picolax drops 20 drop every 12 hours.

Antibiotic preparation:

- Clindamycin (Dalacin-C) 300mg capsule every 8 hours plus metronidazole 500mg tablet every 8 hours.

One day before surgery:

- NPO.
- I.V Fluids.
- MBP using Picolax drops 20 drop every 12 hours.

The third protocol:

Two days before surgery:

- Liquid or low residual diet.
- MBP (lactulose every 8 hours (one spoon).

One day before surgery:

- NPO.
- I.V Fluids.
- The regular MBP lactulose every 8 hours (one spoon).

Antibiotic preparation*:*

- Metronidazole 500mg by oral route every 8 hours 24 hour before skin incision.
- One dose of third generation Cephalosperins (ceftriaxone) 1gm (Just before skin incision).

Ethics approval and consent to participate: The study proposal was reviewed and agreed by The General Organization for Teaching Hospitals and Institutes Research Ethics Committee no. HS000136. During the investigation, the Helsinki Declaration was adhered to.

Statistical analysis: The collected data were revised, coded, tabulated and introduced to a PC using Statistical Package for Social Science **(SPSS V-24).**

RESULTS

There were no significant differences in age, body mass index (BMI) and parity among the study groups (table 1). Total abdominal hysterectomy with bilateral salpingo-oophorectomy (TAH & BSO) was the most prevalent surgical procedure 46/90 followed by total laparoscopic hysterectomy and bilateral salpingo-oophorectomy (TLH &BSO) operation23/90, Tubo-ovarian abscesses drainage 12/90 and Debulking operation 9/90 with statistical insignificant difference between study groups (table 2). The overall evaluation of the surgical field was graded as good or excellent in 90% of the patients in group C, 33.3% in group B and 46.6% in group A with statistically significant difference (P=0.011) (table3). Mean postoperative length of stay was comparable among our study groups. Bowel movement showed insignificant difference between both groups (p=0.527) (table 4). group B had the highest complications in form of Bowel injury, sepsis, bowel movement, time to pass stool and death but with statistical insignificant differences among our study groups. Postoperative pain score showed significantly differences among groups (p<0.001) with the most severe degree among group B and C (table 5).

Table (1): Demographic and clinical characteristics among the study groups.

	Group A	Group B	Group C	P-Value
Age	48 ± 9	47.4 ± 9.8	46.4 ± 9.6	0.844*
Parity	2.1 ± 0.71	1.9 ± 0.90	2.0 ± 1.0	0.215*
BMI	32.77± 6.3	35.5 ± 5	34.8 ± 5.5	0.20*

**There was no statistical significant difference between studied groups as regards demographic data
*Statistically significant as p <0.05 *Used tests to calculate P value: ANOVA t test

Table (2): Clinical characteristics among the study groups.

Surgical procedure	Group A (N=30)	Group B (N=30)	Group C (N=30)	P-Value
Debulking operation	2(6.7%)	3(10%)	4(13.3%)	0.817*
TLH &BSO	6(20%)	9(30%)	8(26.7%)	
Tubo-ovarian abscesses drainage	6(20%)	3(10%)	3(10%)	
(TAH &BSO) in cases of frozen pelvis	16(53.3%)	15(50%)	15(50%)	

*There was no statistical significant difference between studied groups as regards clinical characteristics
***statistically significant as p<0.05.** *Used tests to calculate P value**: Fisher exact test.**

Table (3): Surgeon evaluation of the surgical field.

Overall evaluation	Group A (N=30)	Group B (N=30)	Group C (N=30)	P-Value
Poor	2(6.7%)	3(10%)	0(0%)	**0.011***
Sufficient	7(23.4%)	6(20%)	1(3.3%)	
Medium	7(23.3%)	8(26.7%)	2(6.7%)	
Good	7(23.3%)	13(33.3%)	8(26.7%)	
Excellent	7(23.3%)	0(0%)	19(63.3%)	

* There was statistical significant difference between studied groups as surgical field preparation
*Statistically significant as p<0.05. *Used tests to calculate P value: Fisher exact test.

Table (4): Post-operative data among the study groups.

	Group A (N=30)	Group B (N=30)	Group C (N=30)	P-Value
Postoperative length of stay (day)	5.73±0.51	5.73±1.17	5.5±0.49	0.531*
Bowel movement(days)	2.3±0.97	2.4±0.85	2.09±0.92	0.527*

There was no statistical significant difference between studied groups as regards Postoperative length of stay and Bowel movement
* statistically significant as p<0.05. *Used tests to calculate P value :ANOVA test.

Table (5): Post-operative complications among the study groups.

	Group A (N=30)	Group B (N=30)	Group C (N=30)	P-Value
Bowel injury	0 (0%)	1(3.8%)	0 (0%)	1.00**
Surgical site infection	5(16.7%)	5(16.7%)	7(23.3%)	0.799*
Postoperative pain score (VAS) Mild Moderate Intense ???	 14(46.7%) 13(43.3%) 3(10%)	 0(0%) 16(53.3%) 14(46.7%)	 0(0%) 15(50%) 15(50%)	**<0.001***
Sepsis/DIC	0(0%)	1 (3.3%)	0(0%)	1.00**
Death	0(0%)	1 (3.3%)	0(0%)	1.00**

Statistical significant difference in Postoperative pain score while no statistical significant difference regarding other post-operative complications between studied groups as regards post-operative complications
Statistically significant as p<0.05. *Used tests to calculate P value: *Chi-square test; ** Fisher exact test.

DISCUSSION

The original Condon and Nichols [5] preparation is the oral antibiotic preparation that has been examined the most and is the most well-tolerated. The schedule looks like this:

- Oral neomycin (1 g) administered at 2:00, 3:00, and 10:00 pm.
- At 2:00, 3:30, and 10:00 pm., 1 g of erythromycin base is administered.
- For improved tolerability, 500 mg of metronidazole may be used in place of erythromycin. Excellent anaerobic activity, enterohepatic circulation, and therapeutic efficacy have all been demonstrated by metronidazole [(5)].

So, this study aimed to evaluate the different protocols used in chemical bowel preparation in patients undergoing major gynecological surgeries.

In our study, TAH & BSO was the most prevalent surgical procedure 46/90 followed by TLH &BSO operation 23/90, Tubo-ovarian abscesses drainage 12/90, and Debulking operation 9/90 with statistical insignificant difference between study groups. Our study groups had no significant differences in age, BMI, and surgical procedure.

In agreement with **Ortiz-Martinez *et al.*** [(6)] study in which the most frequent surgical procedure was hysterectomy (22.34%).

In our study, mean postoperative length of stay was comparable among our study groups. Bowel injury, sepsis, time to pass stool, and death had no significant differences among our study groups. Preoperative discomfort showed significantly differences among groups ($p<0.001$). Bowel injury, sepsis and death were common among group B (Clindamycin + metronidazole).

Our study results found that group C (Cephalosporins + metronidazole) had the highest rate of surgical site infection with statistically insignificant difference. A study found that by using surgical antimicrobial prophylaxis (AMP) appropriately, 40–60% of SSIs can be avoided. About 30–50% of antibiotics administered in hospitals are for surgical prophylaxis; however, 30–90% of these antibiotics are misused, which is the reason why 16% of surgical site infections occur [(7)].

Ceftriaxone was reported to be used as a preventive antibiotic in the study area by another investigation. Eight medications were subjected to susceptibility tests to recognize microbes. A third of them were resistant to germs that are resistant to erythromycin, tetracycline, and ampicillin. The sensitivity patterns of the remaining 65% of medications were varied. Pseudomonas aeruginosa was 100% susceptible to ceftriaxone and ciprofloxacin, while Klebsiella species showed 88.9% susceptibility to both medications. Pseudomonas aeruginosa and Klebsiella species displayed distinct resistance patterns to chloramphenicol and gentamicin.

It was discovered that gram-negative Escherichia coli organisms are resistant. The sole isolate that was found to be gram-positive and susceptible to both ciprofloxacin and cloxacillin was Staphylococcus aureus. The sample exhibited complete sensitivity to ceftriaxone and gentamicin, but shown resistance to chloramphenicol. P-values of 0.021 and 0.001, respectively, indicated the highest sensitivity for ceftriaxone and ciprofloxacin. It was discovered that chloramphenicol was resistant to both Gram-positive and Gram-negative organisms [(8)] .

In another study, of the 413 patients, 152 (36.8%) underwent general surgery, with the remainder patients undergoing alternative procedures. Two surgical antibiotic agents (20.3%) were used for surgical prophylactic indications, while 196 patients (79.7%) were treated with just one antibiotic. 46 patients (11.1%) had surgical site infections prior to being released from the hospital. In those patients who need treatment for SSIs, almost half of them (49.5%) received combination therapy of ceftriaxone and metronidazole [(9)].

A comprehensive review of evidence-based practices for cesarean sections highlighted three randomized controlled trials that examined different antibiotic protocols. The regimens studied ampicillin/sulbactam, a combination of ampicillin, gentamicin, and metronidazole, and penicillin with cephalothin showed no significant advantage over the standard use of cephalosporin for prophylaxis [(10)].

Ceftriaxone was the medication most frequently administered for AMP in another study, with metronidazole coming in second [(11)]. Choosing an antibiotic for surgical prophylaxis that has the smallest antibacterial spectrum is crucial in order to prevent resistance from developing and to cover the majority of contaminating germs for that particular type of surgery. The choice of antibiotics used in all patients who underwent antimicrobial prophylaxis did not follow the guidelines provided by the [(12)].

Guidelines, which could be brought about by the lack of their own guidelines, the belief that ceftriaxone and cefazolin are comparable, or the unavailability of first-generation cephalosporins [(11)].

In our study, mean postoperative length of stay was comparable among our study groups. Bowel movement showed insignificant difference between both groups ($p=0.527$). This conclusion is supported by recent studies utilizing statewide and national registry data have found that combining oral antibiotics with mechanical bowel preparation before surgery is associated with reduced risks of surgical site infections, anastomotic leaks, ileus and improved healthcare services outcomes, like length of stay and readmission. The National Surgical Quality Improvement Program (NSQIP) data was used in a number of studies that found a reduction in infection complications when oral antibiotics and mechanical bowel preparation were

combined [13].

Research conducted by the Michigan Surgical Quality Collaborative has also shown that propensity-matched pairs receiving oral antibiotics and mechanical bowel preparation had lower rates of SSI (5.0% vs. 9.7%) and abdominal abscess (1.6% vs. 3.1%) than those receiving neither oral antibiotic preparation nor mechanical bowel preparation. Additionally, postoperative C- difficile evaluation has been conducted using the Michigan data also have been used to evaluate postoperative C- difficile colitis, revealing lower rates (0.5% vs. 1.8%) among the oral antibiotic group [14,15].

In our study, group B had the highest complications in form of Bowel injury, sepsis, bowel movement, time to pass stool and death but with statistical insignificant differences among our study groups. Postoperative pain score showed significantly differences among groups ($p<0.001$) with the most severe degree among group B and C. 126 participants were scheduled for laparoscopies in another trial. Patients were randomized, the night before the laparoscopy, to receive either no bowel preparation or MBP plus 90 ml of oral sodium phosphate (NaP). High statistical significance was observed in the differences in VAS values for nausea/vomiting, hunger/thirst, abdominal distension, sleeplessness, and weakness [16].

There is debate over the usefulness of using oral antibiotics in addition to mechanical bowel prep. When oral antibiotics were given to MBP, studies indicated a reduction in the incidence of surgical incisional infections (17%–5%). Standard MBP with sodium phosphate was the first step in this regimen, which was finished by 6 pm. Amikacin (2 g) and metronidazole (2 g) were administered at 7 and 11 pm. Then, data from 12 other trials were used to create a meta-analysis in which children were randomly assigned to receive oral antibiotics; all patients were given a typical preoperative antibiotic course from their parents. Reduction in SSI for mechanical-plus-oral bowel preparation in elective colon surgery was demonstrated by the meta-analysis [17].

In order to reduce SSI following elective colorectal resections, oral antibiotic prophylaxis in conjunction with MBP and intravenous antibiotics was more effective than MBP and intravenous antibiotic prophylaxis alone. Significantly lower rates of anastomotic leak, ileus, reoperation, length of stay, readmission, and mortality were all linked to this therapeutic strategy. As long as aminoglycosides were used, there was no correlation between the mix of antibiotics and the result. When taken orally, aminoglycosides circulate at very low levels and toxicity is quite uncommon [18].

CONCLUSION

In the light of our own research, we supports previous evidence suggesting that the addition of oral antibiotics to mechanical bowel preparation may reduce postoperative complications, particularly surgical site infections, without significantly affecting other outcomes such as length of hospital stay or bowel function recovery. While no statistically significant differences were observed across most clinical variables among the study groups, notable findings regarding preoperative discomfort and postoperative pain highlight the importance of tailoring bowel prep protocols to optimize both efficacy and patient comfort.

Funding: No funds were received.
Conflict of interest: There are no conflicts of interest.
Acknowledgements: The authors express appreciation to Dr. Abd El-Fatah Hegazy and Mohamed Shahen for their valuable help and advice all over the time of study.

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