

ORIGINAL RESEARCH

Assessment of outcomes of peritoneal lavage using normal saline versus metronidazole in operated perforation peritonitis patients at a tertiary centre

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ABSTRACT

Background: An inflammatory reaction known as peritonitis results from perforating, ischemic, and infectious damage to the genitourinary system and the gastro-intestinal tract (GIT).

The present study was conducted to compare outcomes of peritoneal lavage using normal saline and metronidazole in perforation peritonitis patients.

Materials & Methods: 84 cases of perforation peritonitis of either gender were divided into 2 groups of 42 each. Group I received metronidazole 100 mL plus 2 L normal saline lavages and group II received 2 L normal saline lavage. Parameters such as causes, hospital stay, and outcomes of the treatment were compared.

Results: Group I had 22 males and 20 females and group II had 21 males and 21 females. Causes were gastric perforation in 10 and 11, jejunal perforation in 2 and 3, duodenal perforation in 8 and 9, ileal perforation in 14 and 12, appendicular perforation in 3 and 1, colonic perforation in 2 and 2, rectal perforation in 2 and 1, and caecal perforation in 1 and 1 patients in group I and II respectively. Hospital stay was <10 days in 30 and 14 and >10 days in 12 and 28 patients in group I and II respectively. Outcome was sepsis in 2 and 3, wound dehiscence in 4 and 2, SSI in 1 and 4, and intra-abdominal abscess in 3 and 5 patients in group I and II respectively. The difference was significant (P< 0.05).

Conclusion: In terms of sepsis and hospital stay, metronidazole-based lavage is unquestionably superior to saline lavage, with a statistically significant difference.

Keywords: peritoneum, intra-abdominal organs, wound

Introduction

The peritoneum, which is divided into two main segments, is the body's largest serosal membrane. There are two types of peritoneum: the visceral peritoneum covers the surface of intra-abdominal organs, and the parietal peritoneum covers the internal surface of the wall of the abdomen, including the diaphragm and pelvis. The peritoneum's surface area is almost 2 m², or roughly the same as the skin's area. Normally, the peritoneal cavity holds only approximately 75 milliliters of fluid, which acts as a lubricant between the wall and the abdominal viscera.¹ An inflammatory reaction known as peritonitis results from perforating, ischemic, and infectious damage to the genitourinary system and the gastro-intestinal tract (GIT).² There are three types of peritonitis- primary peritonitis, which arises from an external source outside the peritoneal cavity and is typically mono-microbial; secondary peritonitis, which arises from an intra-abdominal source, usually a perforated hollow viscous organ; or tertiary peritonitis, which develops after secondary peritonitis is treated. The combination of numerous factors, such as patient-related factors, disease-specific factors, and diagnostic and therapeutic measures, determines the prognosis and outcome of peritonitis.³ Many fluids have been employed in lavage procedures. One of these is the antibiotic and antiprotozoal medication metronidazole.⁴ By interfering with microbial organisms' Deoxyribonucleic Acid (DNA), it prevents the formation of nucleic acids. Studies evaluating the effectiveness of imipenem, saline, metronidazole, chloramphenicol, and cephalosporin lavage have been published.⁵

Aims and objective: The present study was conducted to compare outcomes of peritoneal lavage using normal saline versus metronidazole in perforation peritonitis patients.

Materials & Methods

The present prospective, longitudinal study was carried out in the Department of Surgery, Government Medical College and Hospital, Bettiah, West Champaran, Bihar, India. All patients admitted in General surgical Ward/unit either through OPD or emergency, presenting with perforation peritonitis. The present study consisted of 84 cases of perforation peritonitis of either gender. All were informed regarding the study and their written consent was obtained. The institutional ethical committee granted ethical approval. The duration of study was from January 2022 to December 2023. All patients completed a minimum of 1-year follow-up and the follow-up data was collected and finally evaluated. Keeping power (1-beta error) at 80% and confidence interval (1-alpha error) at 95%, the minimum sample size required was 60 patients; therefore, we included 84 (more than the minimum required number of cases) patients in the present study.

Inclusion Criteria

- All patients who underwent laparotomy and had perforated peritonitis were found to have pneumoperitoneum and free fluid based on ultrasound/contrast enhanced computed tomography (USG/CECT) scans of the abdomen.
- Patients to give written informed consent
- Available for follow up.

Exclusion Criteria:

- Patients not give written informed consent
- Patients with co-morbid conditions such as diabetes, cirrhosis, long-term renal failure, and the use of steroids.
- Consuming alcohol, pregnant and lactating women

Patients who visited the study institution with clinical signs of peritonitis (such as abdominal pain, distension, and vomiting) underwent a clinical examination. In the majority of these cases, an erect abdominal radiograph was used to confirm the diagnosis, which showed evidence of gas under the diaphragm. In certain cases, the abdomen was examined by USG, while in other situations; an abdominal CT scan was performed. Additionally, routine blood tests were done. In order to prepare them for surgery, patients received intravenous fluids and antibiotics. The patient and the patient's family members were informed in their native tongue about the patient's condition and prognosis.

Data such as name, age, gender, etc. was recorded. Patients were divided into 2 groups of 42 each. Group I received metronidazole 100 mL plus 2 L normal saline lavages and group II received 2 L normal saline lavage. Parameters such as causes, hospital stay, and outcomes of the treatment were compared.

Study Procedure

Patients were divided into two groups: the normal saline lavage group and the metronidazole lavage group. The normal saline lavage group received intra-peritoneal lavage with 2 L of normal saline. The metronidazole lavage group received intra-peritoneal lavage using 2 L of normal saline mixed with 100 mL (500 mg) of metronidazole. The lavage was done for 20 minutes after the closure of the perforation. Patients were followed up until the discharge or death of the patient. Postoperative complications were noted. A postoperative hospital stay was noted.

Postoperative course:

The vital signs and input/output were regularly monitored. The necessary investigations were done, as was a follow-up. The patient was encouraged to walk and move their limbs both actively and passively. All patients received the same postoperative antibiotics: 500 mg IV for seven days, 500 mg IV for twelve hours, and 4.5 gram IV for amikacin and tazobactam every eight hours. After 48 hours, the primary dressing was taken off, and a povidone-iodine solution was used for daily dressing. The wound had been inspected and examined for signs of infection, including pus, seroma, and sinus formation, as well as any bleeding or discharge. In case there was any purulent discharge, swab cultures were obtained. The amount and character of content (serious, purulent, and bloody) in the drain outflow were monitored every day, around the clock. To check for bowel sounds, the abdomen was auscultated. Bowel sounds were audible for one minute during auscultation over the right para-umbilical area. On day twelve, following surgery, the stitches were taken out.

Statistical Analysis: Results thus obtained were subjected to statistical analysis using Statistical Package for the Social Sciences (SPSS) 25.0, Microsoft 16 and chi-square test. P value less than 0.05 was considered significant.

Results

Mean age of patients in group I was 46.91 ± 12.80 years whereas in group II was 44.05 ± 10.63 years respectively.

Table I: Gender and age wise distribution of patients

Parameters	Group I: Metronidazole Group (n=42)	Group II: Normal saline group (n=42)
Method	metronidazole 100 mL plus 2 L normal saline lavages	2 L normal saline lavage
Gender		
Male	22	21
Female	20	21
Age group (in years)		
≤40	17 (40.48%)	19 (45.24%)
41-60	15 (35.71%)	14 (33.33%)
>60	10(23.81%)	09 (21.43%)

Table I, shows that group I had 22 males and 20 females and group II had 21 males and 21 females. Maximum number of patients in both the groups was in the age group ≤40 years with p value 0.84.

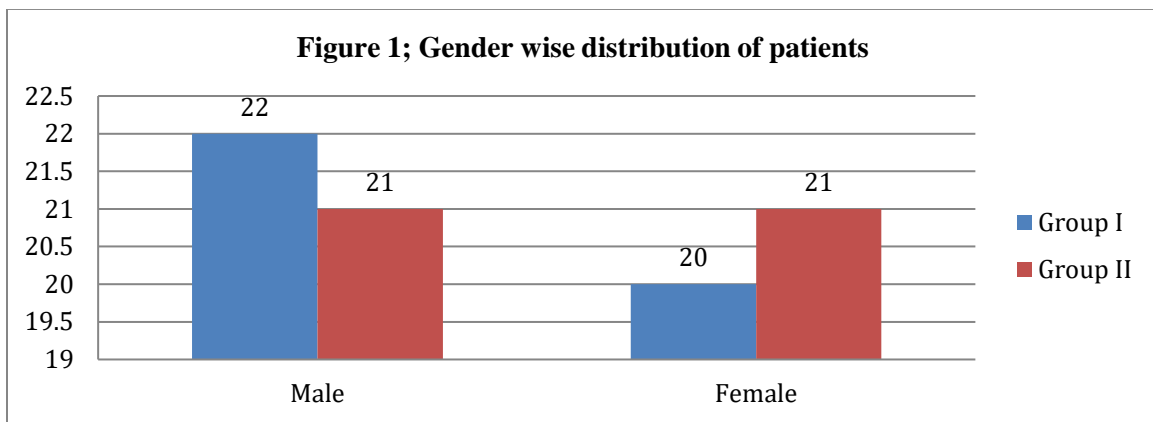
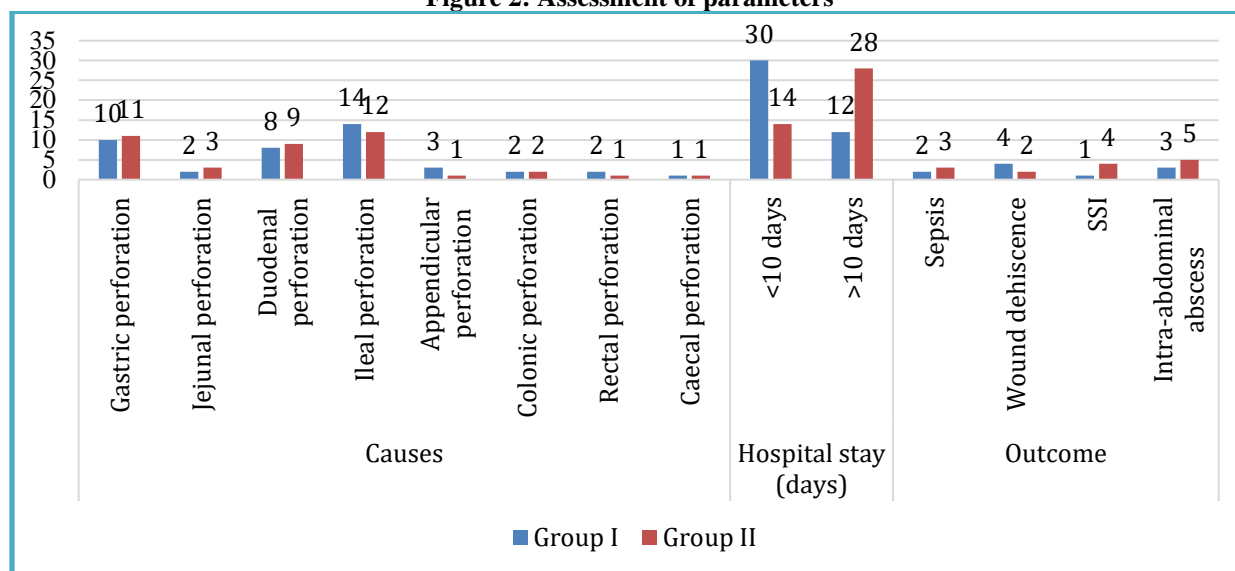


Table II: Assessment of the Cause of Peritonitis, Comparison of Hospital Stay, and Outcome

Parameters	Variables	Group I(n=42)	Group II(n=42)	P value
Causes	Gastric perforation	10	11	0.17
	Jejunal perforation	2	3	
	Duodenal perforation	8	9	
	Ileal perforation	14	12	
	Appendicular perforation	3	1	
	Colonic perforation	2	2	
	Rectal perforation	2	1	
	Caecal perforation	1	1	
Hospital stay (days)	<10 days	30	14	0.01
	>10 days	12	28	
Outcome	Sepsis	2	3	0.04
	Wound dehiscence	4	2	
	SSI	1	4	
	Intra-abdominal abscess	3	5	

Table II, graph I show that causes were gastric perforation in 10 and 11, jejunal perforation in 2 and 3, duodenal perforation in 8 and 9, ileal perforation in 14 and 12, appendicular perforation in 3 and 1, colonic perforation in 2 and 2, rectal perforation in 2 and 1, and caecal perforation in 1 and 1 patients in group I and II respectively. Hospital stay was <10 days in 30 and 14 and >10 days in 12 and 28 patients in group I and II respectively. Outcome was sepsis in 2 and 3, wound dehiscence in 4 and 2, SSI in 1 and 4, and intra-abdominal abscess in 3 and 5 patients in group I and II respectively. The difference was significant (P< 0.05).

Figure 2: Assessment of parameters



Discussion

Surgical emergencies involving perforation peritonitis are frequent.⁶ These patients still have a high prevalence of post-operative complications, which contributes to morbidity and death even with all the advancements in the surgical field.^{7,8} A crucial stage in the surgical treatment of perforation peritonitis is peritoneal lavage. The type of fluid used for lavage can affect the complications that arise after surgery.^{9,10} The present study was conducted to compare outcomes of peritoneal lavage using normal saline and metronidazole in perforation peritonitis patients.

We found that group I had 22 males and 20 females and group II had 21 males and 21 females. Majority of the patients were male. Gupta et al.¹¹ compared the outcomes of peritoneal lavage using normal saline versus metronidazole in cases of perforation peritonitis in patients undergoing laparotomy, concerning surgical site infections, sepsis, wound dehiscence, hospital stay. In the present study, ileal perforation was the leading cause of peritonitis, followed by gastric perforation and duodenal perforation. All patients had perforation peritonitis and received either normal saline or normal saline + metronidazole lavage. Metronidazole lavage proved better in all aspects; however, the difference was found to be statistically significant in sepsis and shorter hospital stays. The present finding is similar to Meena R et al.¹⁰. The patients in the metronidazole group had a shorter hospital stay as compared to the normal saline group, and the difference was significant. In this study, there was a 20% reduction in the incidence of wound infection in the metronidazole group; however, the difference was statistically significant ($p = 0.04$). There was a 20% reduction in the incidence of surgical site infection in the metronidazole group as compared with the normal saline group, and a 5% reduction was seen in the incidence of intra-abdominal abscess in the metronidazole group as compared with the normal saline group. The incidence of sepsis was higher in the normal saline-lavage group. The incidence of mortality and wound dehiscence was also higher in the normal saline lavage group. Schein M et al.⁷ also reported a shorter hospital stay (10 days) in the chloramphenicol lavage group than in the saline group (13 days). Bhushan C. et al.¹² also found a significant reduction in mortality in the antibiotic lavage group. Sulli D and Rao MS¹³ reported a decreased incidence of infection, sepsis hospital stay, and mortality in the metronidazole group, but the difference was not statistically significant for any parameter. Choudhary V. and Dhankar AA¹⁴ found a reduction in wound infection, sepsis, abscess formation, and mortality in the metronidazole group vs. the saline group, but the difference was not statistically significant. Santosh CS et al.¹⁵ compared imipenem with saline lavage and found a statistically significant reduction in wound infection, intra-abdominal abscess, sepsis, and mortality in the imipenem group. The results of Bhushan et al.¹² of postoperative peritoneal lavage using balanced saline and antibiotic solution in 30 patients with diffuse peritonitis show that such lavage is a significantly useful adjunctive treatment in the management of diffuse peritonitis. It appreciably reduces mortality and morbidity. Its adjunctive use in suitable cases along with surgery can be safely advocated in clinical practice.

Santosh et al.¹⁵ in their study 90 patients aged between 12 and 60 years who are operated for perforation peritonitis were divided into 3 groups and underwent post-laparotomy irrigation as follows saline and fluid drained, saline, and then imipenem wash at a concentration of 1mg/ml and fluid drained after 5 minutes, saline and then imipenem wash

at a concentration of 1 mg/ml and drain was clamped for 1 hour. The patients were then observed for post-operative complications. There was a statistically significant reduction in post-operative wound infection (33.33%), intra-abdominal abscess (23.33%) and sepsis (23.33%) in group 3 when compared to other two groups. Group 3 had a much lower mortality rate (3.33%) when compared to the other two (16.67% and 6.67% respectively.)

Limitations of the study: The limitation of the study is the small sample size and short duration of study.

Conclusion

Authors found that in terms of sepsis and hospital stay, metronidazole-based lavage is unquestionably superior to saline lavage, with a statistically significant difference.

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