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Original Article

Intraoperative Lavage in Peritonitis – Comparison between Saline and Metronidazole

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ABSTRACT

Background and Objectives: Peritonitis is a fairly common and challenging disease; we come across in the surgical practice. Operative treatment and intra-operative peritoneal lavage are the main stay of the treatment. Different types of fluids are used for peritoneal lavage. The objectives of this study are to compare the outcome in terms of, surgical wound infection, intra-abdominal abscess, sepsis, and hospital stay in saline peritoneal lavage group and metronidazole peritoneal lavage group in operated cases of peritonitis.

Materials and Methods: All patients who underwent laparotomy for peritonitis from February 2019 to May 2020 were studied, excluding patients younger than 15 years and older than 60 years. A total of 100 patients were studied, who were randomly divided into two groups receiving Saline IOPL and Metronidazole IOPL. Outcomes were compared between the two groups.

Results: There was a reduction in incidence of wound infection in metronidazole IOPL group by 14%, sepsis was reduced by 10%, and intra-abdominal abscess by 2%. Mortality was increased by 2% in the metronidazole lavage group. Mean hospital stay was lesser in the metronidazole lavage group by 1.8 days. However, none of these findings were found to be statistically significant.

Conclusion: There is a small improvement in the outcome when metronidazole is used for IOPL in peritonitis patients, but not up to statistically significant levels. The increased mortality in the metronidazole lavage group may be due to selection bias. There is no statistically significant difference in outcome between the saline group and metronidazole group.

Key words: Lavage, Metronidazole, Peritonitis

INTRODUCTION

Peritonitis is defined as inflammation of the serosal membrane that lines the abdominal cavity and the organs contained therein. Peritonitis usually occurs secondary to contamination of the peritoneal cavity by the gastro intestinal contents, either due to perforation of the hollow viscera or due to translocation of bacteria through the wall of ischemic gut.

Surgical closure of the perforation and intra-operative peritoneal lavage (IOPL) has been the cornerstone in the management of patients with peritonitis. Different types of fluids have been used for peritoneal lavage in peritonitis patients. These include, sterile water, warm saline, aqueous Povidone-iodine, and saline with antibiotics.

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Peritoneal lavage reduces the bacterial load, thereby reducing the incidence of post-operative surgical site infection and sepsis. Addition of antibiotics like metronidazole, tetracycline, netilmicin to the lavage fluid is being widely practiced in the treatment of peritonitis patients. Some studies have shown that there is no distinct advantage of adding antibiotics to the lavage fluid as therapeutic levels of the antibiotic are attained in the peritoneal fluid with intravenous injections.

In this study, peritonitis patients are divided into two groups randomly. In the first group of patients, warm saline is used for IOPL. In the second group, 200 ml of metronidazole is added to the saline for peritoneal lavage. Outcomes of both groups are compared to assess whether there is any advantage adding

Aims and Objectives of the Study

The objectives of the study were to compare the outcome in terms of, surgical wound infection, intra-abdominal abscess, and sepsis, hospital stay in saline peritoneal lavage group, and metronidazole peritoneal lavage group in operated cases of peritonitis metronidazole to the lavage fluid.

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MATERIALS AND METHODS

This comparative study of peritoneal lavage using saline versus metronidazole is based on 100 cases of peritonitis operated at Government Medical College, Siddipet, Telangana State during the period from February 2019 to May 2020.

Inclusion Criteria

All cases of peritonitis who underwent laparotomy were included in the study.

Exclusion Criteria

- Patients older than 60 years
- Patients younger than 15 years of age
- Patients coming with clinical features of peritonitis were assessed by thorough clinical examination. Diagnosis was confirmed by erect X-ray of the abdomen in most of the cases with the evidence of free gas under the diaphragm. USG abdomen was done in some cases. Investigations such as hemoglobin, total count, differential count, blood urea, and serum creatinine were done. Cases were randomly divided into two groups, each receiving plain saline peritoneal lavage and metronidazole lavage. Plain saline lavage group received IOPL with 2L of saline. Metronidazole lavage group received IOPL using 2L of saline mixed with 200 ml of metronidazole. Cases were followed up till the discharge or death of the patient. Post-operative complications – wound infection, intra-abdominal abscess, sepsis, fecal fistula, and death were noted. Post-operative hospital stay noted. Data were tabulated. Results of the two groups in terms of wound infection, intra-abdominal abscess, sepsis, fecal fistula, mortality, and post-operative hospital stay were compared using standard statistical tests. Results expressed as graphs and charts. Results are compared with other similar studies done in the past.

RESULTS

Hundred cases of peritonitis were studied. Fifty cases received plain saline peritoneal lavage and 50 received lavage using saline and metronidazole.

Cases studied were in the age group of 15–60 years. Highest number of cases was in the age group of 21–30 years (32%). Lowest number was in the age group of <20 years (2%) [Table 1].

Majority of cases were males. Males to female ratio - 6.14:1 [Table 2]

- The frequency of cause of peritonitis is as follows

The most common cause of peritonitis in this study was duodenal ulcer perforation (60%), followed by ileal (21%) and appendicular perforation (9%). Other causes were gastric perforation, ischemic bowel, traumatic jejunal perforation, and perforated Meckel's diverticulum [Table 3].

- Results of the operative procedure performed are as follows

In most of the patients perforation was closed primarily (78). Out of which 60 were duodenal perforations, 12 were ileal perforations, five were gastric perforations, and one was jejunal perforation. Resection and anastomosis of bowel were performed in 12 cases (eight ileal perforations, three ischemic bowels, and one perforated Meckel's diverticulum). Appendicectomy was done in nine cases. One patient with ileal perforation underwent ileostomy [Table 4].

In the saline lavage group incidence of wound infection was 40%. About 12% of the patients had intra-abdominal abscess. Sepsis was present in 28% of patients. About 6% of patients developed fecal fistula during the post-operative period. Mortality was 8% in this group [Table 5].

In the metronidazole lavage group incidence of wound infection was 26%. About 10% of the patients had intra-abdominal abscess. Sepsis was present in 18% of patients. About 6% of patients developed fecal fistula during the post-operative period. Mortality was 10% in this group [Table 6].

There was a 14% reduction in the incidence of wound infection in metronidazole lavage group when compared to saline lavage group. Incidence of intra-abdominal abscess reduced by 2% in metronidazole lavage group. About 10% reduction was seen in the incidence of sepsis in patients receiving metronidazole peritoneal lavage. There was no difference in the incidence of fecal fistula in either group. Mortality was higher in metronidazole lavage group by 2%. Chi-square test did not show any statistical significance of these apparent advantages of metronidazole lavage over saline lavage [Table 7].

The shortest post-operative hospital stay was 2 days where the patient died on 3rd post-operative day. The earliest discharge was after 7 days of hospital stay. The longest stay was 39 days postoperatively. Mean post-operative hospital stay in saline lavage group was 15.04 days and 13.22 days in metronidazole lavage group. However, the difference was statistically not significant.

DISCUSSION

The treatment of peritonitis is associated with a high morbidity and mortality. The usual treatment of the peritonitis consists of fluid replacement, nasogastric

Table 1: Age specific distribution of the cases

Age	No. of cases	Percentage
<20	2	2
21–30	32	32
31–40	30	30
41–50	23	23
51–60	13	13

Table 2: Sex distribution of the peritonitis cases

Sex	No. of cases	Percentage
Males	86	86
Females	14	14

Table 3: Causes of peritonitis

Cause	No. of cases	Percentage
Duodenal ulcer perforation	60	60
Ileal perforation	21	21
Appendicular perforation	9	9
Gastric perforation	5	5
Ischemic bowel	3	3
Traumatic jejunal perforation	1	1
Perforated Meckel's diverticulum	1	1

Table 4: Operative procedures performed

Procedure	No. of cases	Percentage
Primary closure of perforation	78	78
Resection and anastomosis	12	12
Appendicectomy	9	9
Ileostomy	1	1

Table 5: Outcomes in saline lavage group

Parameter	No. of cases	Total cases	Percentage
Wound infection	20	50	40
Intra-abdominal abscess	6	50	12
Sepsis	14	50	28
Fecal fistula	3	50	6
Death	4	50	8

Table 6: Outcomes in metronidazole lavage group

Parameter	No. of cases	Total cases	Percentage
Wound infection	13	50	26
Intra-abdominal abscess	5	50	10
Sepsis	9	50	18
Fecal fistula	3	50	6
Death	5	50	10

Table 7: Comparison of outcomes of saline lavage group and metronidazole lavage group

Parameter	Saline lavage group (%)	Metronidazole lavage group (%)	*P*-value
Wound infection	40	26	0.2
Intra-abdominal abscess	12	10	1
Sepsis	28	18	0.3
Fecal fistula	6	6	0.6
Death	8	10	1

suction, IV antibiotics, and operative intervention. Operation consists of suction of the fluid, which has collected in the peritoneal cavity, and definitive procedure for the pathology of the peritonitis (closure of perforation, closure bypass, resection, and anastomosis or appendicectomy, etc.). This is followed by peritoneal lavage and then the abdomen is closed with drain/drains.

Hundred patients were included in this study. Patients were randomly assigned into two groups: Saline lavage group and metronidazole lavage group. Patients in saline lavage group received IOPL with warm normal saline, while patients in metronidazole lavage group received IOPL with saline and metronidazole. Results were compared between the two groups.

Age

In this study, it was found that maximum number of cases was in the age group of 21–30 years. Least number of cases was in the age group of <20 years. Mean age of patients in this study was 37.25 years. This is comparable to the age distribution found by Khan *et al.* where maximum patients were in the age group of 31–40 years. Mean age was 37 years.

Patients younger than 15 years and older than 60 years were excluded from this study.

Sex Distribution

There was a male preponderance of cases in the present study, which is consistent with the values obtained by other studies.

Male to female ratio was 6.14:1.

Duodenal perforation was the leading cause of peritonitis in the present study, followed by ileal perforation and appendicular perforation. Gastric perforation, bowel ischemia, jejuna perforation, and perforation of Meckel's diverticulum were the less common causes of peritonitis.

Wound Infection

In the present study, there was 14% reduction in incidence of wound infection in the metronidazole lavage group. However, this difference is not statistically significant ($P = 0.2$). Similarly, Khan *et al.*[1] reported 20% reduction in incidence of wound infection, when superoxide solution was used for IOPL. On contrary, Schein *et al.*[2] did not find any difference in incidence of wound infection when chloramphenicol was used for IOPL.

Intra-abdominal Abscess

There was a 2% reduction in the incidence of post-operative intra-abdominal abscess in the metronidazole IOPL group. However, this is not statistically significant ($P = 1$). R. Fowler 48 in 1974 reported 16% reduction in the incidence of intra-abdominal abscess when cephaloridine was used for IOPL.

Sepsis

In this study, there was 10% reduction in the incidence of systemic sepsis in the metronidazole IOPL group. Statistically significant difference was not found in the incidence of sepsis between either group.

Fecal Fistula

Study did not find any difference in the incidence of post-operative fecal fistula in saline lavage group or metronidazole lavage group. In contrast to this study, Khan *et al*. (2009) reported 2.5% reduction in the incidence of fecal fistula in the study group, when superoxide solution was used for IOPL. This was not significant statistically.

Mortality

Mortality was 2% higher in the metronidazole IOPL group in this study. However, the difference is not statistically significant. Schein (1990) found no significant difference in mortality of patients treated with or without intraperitoneal lavage with chloramphenicol. Rambo (1972) also found no difference in the number of deaths when intraperitoneal irrigation with cephalothin was used. On the contrary McKenna *et al*. (1970) and Bhushan *et al*. (1975) found significant reduction in mortality in patients treated with antibiotic lavage.

Post-operative Hospital Stay

Mean post-operative hospital stay was 15 days in saline lavage group and 13.22 days in metronidazole lavage group. This improvement in the hospital stay is not statistically significant ($P = 0.17$). Khan *et al*. (2009) reported reduction in hospital stay by 1.5 days, which was not statistically significant. On the contrary, Vallance *et al*. (1985) found no improvement in the duration of hospital stay of patients treated with intraperitoneal lavage with chlorhexidine gluconate or Povidone-iodine when compared with those who received only saline lavage.

CONCLUSION

- Peritonitis is most common in the age group of 21–30 years (32%)
- There is a male preponderance with male:female ratio of 6.14:1
- Duodenal ulcer perforation (60%) is the most common cause of peritonitis, followed by ileal (21%), appendicular (9%), and gastric perforations (5%). Ischemic bowel (3%), perforation of Meckel's diverticulum (1%), and jejunal (1%) perforations are the rarer causes
- Primary closure of the perforation with omental patch is the most commonly performed operation (78%) followed by resection of the perforated segment of the bowel and end to end anastomosis (12%), appendicectomy (9%), and ileostomy (1%)
- There is 14% reduction in incidence of wound infection when metronidazole is used for IOPL. However, this is statistically not significant
- Incidence of intra-abdominal abscess is reduced by 2% in metronidazole lavage group, which is statistically not significant
- There is 10% reduction in systemic sepsis when metronidazole is used for IOPL. However, this is statistically not significant
- There is no difference in the incidence of post-operative fecal fistula whether metronidazole is used for IOPL or saline is used
- There is 2% increase in mortality when metronidazole is used for IOPL. This is not statistically significant
- Mean hospital stay is reduced by 1.8 days when metronidazole is used for IOPL. This is not statistically significant
- Addition of metronidazole to normal saline for IOPL has beneficial effects in terms of reduction in incidence of wound infection, intra-abdominal abscess, systemic sepsis and post-operative hospital stay. However, these are statistically not significant
- There is no statistically significant difference in the outcome between the saline group and metronidazole group

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