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Comparison of Peritoneal Lavage with Normal Saline and Normal Saline Plus Antibiotic in Acute Peritonitis

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Abstract

Background: Peritoneal lavage is a need after laparatomies performed for secondary peritonitis. Some previous studies mentioned the benefit of abdominal lavage with antibiotics, in secondary peritonitis operations. The current study aimed to compare normal saline alone (NS) with normal saline plus gentamicin (NS + G) for abdominal lavage in secondary peritonitis.
Methods: In this randomized clinical trial (RCT), patients who were referred to the emergency department, and were candidates for urgent laparotomy were enrolled. After giving informed consent, 80 patients were randomized into 2 groups of peritoneal lavage with (NS) and (NS + G). Descriptive statistics were calculated for the presented data. Chi-square test and Fisher's exact test was used for determining the association between qualitative variables. Comparison between the groups was made using the nonparametric Mann-Whitney test. The Kolmogorov–Smirnov test was used for normality of the data.
Results: The mean age of the patients was 41.39 years, and 67.5% were male. There were no significant differences in the demographic data, history of abdominal surgery, diabetes, and the cause of peritonitis. Twenty-one patients needed another surgical intervention. The need for surgical interventions was significantly more in the NS group compared to the NS + G group (17.5% vs. 35%, P = 0.039). There was no significant difference in fever, wound infection, admission time, intravenous antibiotic duration, return to work time, and mortality between the 2 groups.
Conclusions: It seems that peritoneal lavage with gentamicin in secondary peritonitis may decrease the need for surgical interventions.

Keywords: Secondary Bacterial Peritonitis, Abdominal Lavage, Normal Saline, Gentamicin

1. Background

Peritonitis is an inflammation of the abdominal peritoneum. Secondary peritonitis is due to bacterial contamination from hollow viscus or external contamination (such as penetrating trauma) (1, 2). Clinical signs of peritonitis include a fever, abdominal pain, distention, and symptoms such as tenderness as well as rebound tenderness (3, 4).

The purpose of surgical intervention includes control of infection, drainage of infectious discharge, excision of all necrotized tissues, extensive peritoneal lavage, and prevention of late complications (5, 6).

The purpose of surgical intervention is source control of infection, drainage of infectious discharge, excision of all necrotized tissues extensive peritoneal lavage, and prevention of late complications (3, 4, 7, 8).

Peritoneal lavage is performed in only generalized peritonitis and is not done in localized infections such as perforated appendicitis with a pri- appendicular peritonitis (9). Some studies report that peritoneal lavage with antibiotic solutions after source control in generalized peritonitis has a better outcome, however, there are other studies that report opposite results (10-12).

Thus, this study was designed to evaluate and compare the results of peritoneal lavage with NS and NS+G in secondary bacterial peritonitis.

2. Methods

This study was a randomized clinical trial (RCT) IRCT2016092529818N1 and was approved by the Baqiyatallah University of Medical Sciences ethics committee.

The inclusion criteria included patients who were referred with a diagnosis of secondary peritonitis from April 2015 to April 2016, individuals who underwent urgent laparotomies, were not under 15 years of age or over 60 years

of age, and did not have a history of allergy to gentamicin, history of kidney disease, dialysis patients, and uncontrolled hypertension.

The exclusion criteria included patients who failed to be followed up as well as patients with peritoneal carcinomatosis.

Eighty enrolled patients were randomly assigned in a 1:1 ratio to peritoneal lavage with NS or peritoneal lavage with NS + G at the end of surgery. Randomization was stratified using a random table number. Informed consent was obtained from all patients before enrollment.

In both groups source control was done and irrigation of foreign particles was performed; then in gentamycin group peritoneal lavage was performed with 240 mg of gentamicin in 500 cc normal saline in 5 minutes. In the normal saline group, peritoneal lavage was done with only 500 cc of normal saline in 5 minutes.

The preoperative evaluation included demographic data, medications, as well as surgical and medical history of the patients. Perioperative evaluation included fever, wound infection, abdominal abscess, and mortality during the 6 months of postoperative follow-up. For recording data, we prepared a standard recording form and the validation of the recording form was assessed using 5 expert surgeon specialists; all recorded variables were chosen according to SIRS (systemic inflammatory response syndrome) definitions (13).

Descriptive statistics were calculated for the presented data. Chi-square test and Fisher's exact test was used for determining the association between qualitative variables. Comparison between the groups was made using the nonparametric Mann-Whitney test. The Kolmogorov–Smirnov test was used for normality of the data. The data was analyzed by SPSS 20 software (SPSS, Chicago, IL, USA). The significance level for all tests was considered 0.05.

3. Results

Eighty patients were evaluated. The mean ± SD age of the participants was 41.39 ± 16.38 years, where 54 (67.5%) were male. Table 1 depicts demographics of the study samples.

Twelve patients (25.0%) had a history of abdominal surgery and 6 (7.5%) had diabetes mellitus. There were no differences between the 2 groups in history of abdominal surgery and diabetes mellitus (P = 0.60, P = 0.39, respectively) (Table 2). The main cause of peritonitis in patients was perforated appendicitis (19 (23.8%)). There was no significant difference between the 2 groups regarding the cause of peritonitis, postoperative length of hospitalization, duration of receiving antibiotics, and time to return to work (Table 2).

Moreover, 21 (26.2%) patients had readmission for reoperation. There was a significant decrease of reoperation in the NS + G group compared to the NS group (P = 0.039) (Table 2). The cause of reoperation in patients was abdominal abscesses (57.1%), wound infection (38.1%), and recurrent peritonitis (4.8%). There was no significant difference between the 2 groups regarding the cause of reoperation (P = 0.098) (Table 3); 31 (38.7%) patients had a fever and 17 patients had an incidence of fever before 48 hours. There were no significant differences in the 2 groups regarding the incidence of fever (P = 0.81) (Table 3).

Twelve patients (25.0%) had erythema. There were no significant differences between the 2 groups regarding the incidence of erythema (P = 0.37) (Table 3). The mortality rate was 9 (11.2%) patients. There were no significant differences in the 2 groups regarding the mortality rate and cause of mortality (P = 0.71) (P = 0.88) (Table 3).

4. Discussion

Although there was no statistically significant difference between groups regarding wound infection, intra-abdominal abscesses, and peritonitis after index surgery, however due to sustained signs and symptoms despite antibiotic therapy, surgical interventions were performed for post-operative complications twice as much as in the NS group. Most of these interventions were performed at the patients' bedsides.

In this study there were no statistically significant differences between groups regarding death (because of peritonitis or because of other precipitating factors). In this regard, this study was different with the Meta analysis performed by Qadan et al. in 2010 (2). Qadan reported a 23.5% decrease in the mortality of animals with induced peritonitis, which underwent peritoneal lavage with antibiotic solutions comparing with those that underwent peritoneal lavage with normal saline alone (2). Qadan analyzed animal studies with induced peritonitis in different animals; those animal studies used different antibiotics and different solutions and also some of the studies did not use intra venous antibiotics. Due to these reasons, Qadan results still cannot be applied (2).

In this study, mortality was not reduced in the gentamycine group, however, in some other studies, the mortality was reported to be reduced in the antibiotic irrigation group (9-12). This difference may be due to the reason that only secondary peritonitis patients were enrolled in this study. However, in the mentioned studies, surgically uncontrollable peritonitis patients were also included and these patients may have an immune compromised situation, which have led to increased mortality in antibiotic-less groups in those studies (1, 3-5, 14).

Table 1. Demographic of Patients in Two Groups[a]

Items	NS	NS + G	Total	P Value
Gender (M/F)	25/15	29/11	54/26	0.304
Age	41.67 (± 15.51)	41.10 (± 17.39)	41.39 (16.38)	0.87

[a]Values are expressed as mean (± SD).

Table 2. Comparison of Confounding Variables in Two Groups[a]

Items	NS	NS + G	Total	P Value
History of surgery (Yes/No)	9/31	11/29	20/60	0.60
Diabetes (Yes/No)	2/38	4/36	6/74	0.39
Cause of peritonitis				
Iatrogenic and Technical (Yes/No)	13/27	10/30	23/57	0.45
Underlying disease (Yes/No)	27/13	30/10	57/23	0.45
Length of hospitalization	9.36 (± 6.26)	10.58 (± 8.71)	10.08 (± 7.55)	0.557
Duration of antibiotic therapy	9.60 (± 6.14)	10.58 (± 8.70)	10.14 (± 7.32)	0.56
Time to return to work	14.61 (± 8.37)	14.14 (± 6.84)	14.38 (± 7.61)	0.79

[a]Values are expressed as mean (± SD).

Table 3. Rate of Postoperative Complications in Two Groups

Items	NS	NS + G	Total	P Value
Reoperation (Yes/No)	14/26	7/33	21/59	0.039
Abscess (Yes/No)	7	5	12	0.098
Peritonitis	1	0	1	0.144
Wound infection	6	2	8	-
Fever (Yes/No)	20/20	20/20	40/40	0.81
Fever < 48 (Yes/No)	7	10	17/63	0.098
Fever > 48 (Yes/No)	13/27	8/32	21/59	0.144
Erythema (Yes/No)	7/33	5/35	12/68	0.37
Mortality (Yes/No)	4/36	5/35	9/71	0.72

We did not find any study that evaluated secondary bacterial peritonitis with different etiologies, however, in the Ruiz-Tovar et al. study (9), prophylactic peritoneal lavages with and without antibiotics were performed at the end of elective colorectal surgeries and they reported a reduction in superficial as well as deep wound infection and less reoperation due to infection in antibiotic group. The difference between Ruiz-Tovar's results in reducing wound infection and our results may be due to the fact that they made use of gentamycine + clindamycine and we used only gentamycine, however, the need for reoperation due to wound infection was reduced in both studies, which show the benefit of antibiotic lavage at the end of operations (9).

In an another study done by Ruiz-Tavor et al., with prophylactic peritoneal lavages with and without antibiotics, the mortality rate in antibiotic group were reduced but we saw no reduction in mortality in the antibiotic group of our study, this may be due to the 2 antibiotics used in Ruiz-Tavor's study compared with 1 in ours, or may be because of confounding factors such as risk increasing predisposing factors in Ruiz-Tavor's study (15).

4.1. Conclusion

In this study peritoneal lavage with gentamycine reduced the need for reoperation due to wound infection, however, due to heterogeneity of peritonitis etiologies in the study and limited number of studied patients, there is a need for further human studies in this regard.

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