

Immediate Postoperative Outcome of Peritoneal Lavage with Povidone-Iodine Based Normal Saline Versus Normal Saline in Duodenal Ulcer Perforation

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Abstract

Original Research Article

Background: Duodenal ulcer perforation is a common surgical problem, it usually causes peritonitis. Postoperative minor and major complications are common in patients with peritonitis. Intraoperative peritoneal lavage is an important step of operative management and choice of fluid for peritoneal lavage can affect the outcome. **Objectives:** To compare the immediate post-operative outcome of povidone-iodine based normal saline lavage and normal saline lavage in duodenal ulcer perforation. **Methods:** This Quasi experimental study intended to compare the immediate post-operative outcomes between povidone-iodine based normal saline versus normal saline lavage in duodenal ulcer perforation. A total of 100 cases of duodenal ulcer perforation underwent laparotomy in Dhaka Medical College Hospital from January 2021 to December 2022, included in this study according to the inclusion and exclusion criteria. Cases were non-randomly allocated to group A (peritoneal lavage with povidone-iodine based normal saline) and group B (peritoneal lavage with normal saline). Each group consisted of 50 patients. The outcome variables were sepsis, wound infection, intra-abdominal abscess, burst abdomen and hospital stay. Data were analyzed and compared by statistical tests. **Results:** In povidone iodine based normal saline group, there was significant reduction in postoperative wound infection ($p=0.042$), sepsis ($p=0.0414$) and hospital stay ($p=0.0173$). No significant differences were found regarding age ($p=0.3466$), intra-abdominal abscess ($p=0.646$) and burst abdomen ($p=0.522$) between two groups. **Conclusion:** Povidone-iodine based normal saline lavage was better than only normal saline lavage in duodenal ulcer perforation in terms of wound infection, sepsis and hospital stay.

Keywords: Duodenal ulcer perforation, peritoneal lavage, povidone-Iodine, peptic ulcer.

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INTRODUCTION

Duodenal ulceration arises from an intricate interplay between the mucosal defense mechanisms of the gastro-duodenal system and the deleterious agents, notably gastric acid and pepsin. Notably, hyperacidity stands not as a mandatory precursor to duodenal ulcers. Rather, the failure of the mucosal defense mechanisms against the corrosive effects of acid and pepsin

culminates in the development of ulcers. While duodenal ulcers predominantly affect Western populations, gastric ulcers exhibit higher prevalence in Oriental countries, particularly in Japan. The incidence of perforated peptic ulcers tends to be higher among younger patients (mainly male); however, recent trends indicate a rising age among perforated peptic ulcer patients [1]. The epidemiology of perforated peptic ulcer disease mirrors intricate and multifactorial etiological factors. Present-

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day's rapid-paced and instantaneous lifestyle underlines how environmental aspects, primarily *Helicobacter pylori* infections, NSAIDs usage, and smoking, greatly shape the epidemiological landscape of peptic ulcer disease [2].

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Peptic ulcer perforation presents a serious and concerning complication, affecting an estimated 2-10% of cases within the peptic ulcer spectrum on average. This issue is further accentuated by an overall mortality rate of 10%, although specific studies report a broader range of 1.3% to 20% [3]. Site of occurrence commonly occur on the first part of the duodenum (60%), antral (20%) and lesser-curvature gastric ulcers (20%). The evolution of perforated peptic ulcers unfolds through three distinct clinical phases: Phase 1 encompasses chemical peritonitis and contamination, derive from the initial perforation. This event induces a chemical peritonitis in Phase 1. Subsequently, Phase 2 emerges as an intermediate stage, characterized by a pain relief experienced by many patients within 6-12 hours. This relief is believed to result from the dilution of troublesome gastro-duodenal contents through the subsequent production of peritoneal exudates. Eventually, Phase 3, which usually occurs after 12-24 hours, introduces the presence of intra-abdominal infection [4].

Acute peritonitis emerges as a frequently encountered surgical emergency, often arise from secondary causes such as hollow viscous perforation [5]. The perforation of duodenal ulcers can lead to the development of intra-abdominal sepsis, which is responsible for high morbidity and mortality of patients. Although the administration of potent antibiotics, there persist high significant incidence of surgical site infections (SSI). The management of peritonitis a multifaceted approach encompassing general resuscitative measures, treatment of septicemia, source control, and peritoneal lavage. Nonetheless, the employment of peritoneal lavage is a subject of argument. The rationale behind this procedure lies in its role in aiding the peritoneal defense mechanism against bacteria and other injurious agents [6].

Peritoneal lavage stands as a surgical intervention entailing meticulous cleansing of the peritoneal cavity using a sterile solution. This technique is aimed at eliminating bacteria, pus, and other detritus that may accumulate in instances of peritonitis.

Commonly peritoneal lavage is used in treatment of patients with peritonitis caused by bowel perforation [7].

Various fluid formulations have been employed for peritoneal lavage in patients with peritonitis, encompassing sterile water, normal saline, povidone-iodine based normal saline, saline combined with antibiotics, and more. The fundamental objective of peritoneal lavage is to curtail the bacterial burden within the peritoneal cavity, thereby diminishing the risk of septic complications and facilitating an accelerated patient recovery process [8].

The primary objective of the present study is to assess and contrast the immediate post-operative outcomes following duodenal ulcer perforation treatment utilizing two distinct lavage solutions: povidone-iodine based normal saline and normal saline lavage.

OBJECTIVE

General objective

- To compare the immediate post-operative outcome of povidone-iodine based normal saline lavage and normal saline lavage in duodenal ulcer perforation

Specific objectives

- To compare post-operative complication such as wound infection, sepsis, intra-abdominal abscess and burst abdomen between two sets of patients
- To compare duration of hospital stay between two sets of patients

METHODOLOGY

Type of study: Quasi experimental study.

Place of study: Department of Surgery, Dhaka Medical College Hospital, Dhaka.

Duration of study: From January 2021 to December 2022.

Study population: All patients with chronic duodenal ulcer perforation admitted at DMCH.

Sampling technique: Purposive sampling

Sample size: A total of 100 cases

Allocation of study subjects:

Non-random allocation of subjects into two groups-

- Group A (peritoneal lavage with povidone-iodine based normal saline) consisted of 50 cases.
- Group B (peritoneal lavage with normal saline) consisted of 50 cases

Inclusion criteria:

- All patients underwent laparotomy for chronic duodenal ulcer perforation

Exclusion criteria:

- Conservatively treated duodenal ulcer perforation patients.
- Re-laparotomy for duodenal ulcer perforation.

Study procedure

After a decision for laparotomy, the whole procedure of present study was explained to each patient and then asked for consent. Those patients who gave consent was considered as case of the present study. By this way 50 patients were selected as cases in each group.

Group - A (peritoneal lavage with povidone based normal saline) and Group - B (peritoneal lavage with normal saline). Peritoneal lavage with 10 ml of 10% povidone-iodine in each liter warm normal saline was used in group-A patients (Sarada *et al.*, 2020). Only normal saline was given in group-B patients. Amount of fluids for lavage was used until clear fluid came out.

Data collection procedure

Patient's data collection form was include name of the patient along with age, sex, socio-economic status, address & phone number, history of the patients,

diagnosis of the patients by specific investigation, assigned group (group A or B) was selected by non-random sampling. Then laparotomy was done, repair of perforation was done following peritoneal lavage of povidone-iodine based normal saline (group A) or normal saline lavage (group B).

Statistical analysis of data

All the collected data were compiled. Percentages were calculated to find out proportion of the findings. Further statistical analyses of the results were obtained by using Microsoft Xcel, 2010 (Microsoft Corporation, Washington, U.S.) and web based computer software – Graph Pad Software, 2017 (Graph Pad Software, Inc, USA). Quantitative data was expressed as mean and standard deviation and comparison was done by student “t” test. Qualitative data were expressed as frequency and percentage and comparisons were carried by Chi-square (X^2) test and Fisher's exact test. A probability value (p) of less than 0.05 was considered to indicate statistical significance. The summarized findings were then presented in form of tables and graphs.

RESULTS

Table I: Distribution of patients according to age between two groups

| Age (years) | Group | | <i>p</i> value |
|-------------|---|---|----------------|
| | Group A (Peritoneal lavage with povidone-iodine based normal saline) (n = 50) | Group B (Peritoneal lavage with normal saline) (n = 50) | |
| <20 | 8(16%) | 8(16%) | 0.3466 |
| 20-30 | 20(40%) | 18(36%) | |
| 31-40 | 11(22%) | 11(22%) | |
| 41-50 | 5(10%) | 4(8%) | |
| 51-60 | 5(10%) | 5(10%) | |
| >60 | 1(2%) | 4(8%) | |
| Mean ± SD | 32.16±13.01 | 34.88±15.24 | |

Data were analyzed using Student t-test and level of significance was < 0.05.

The mean age of group A was 32.16 (\pm 13.01) years and that of group B was 34.88 (\pm 15.24) years. The

age differences between two groups were not statistically significant. ($p = 0.3466$).

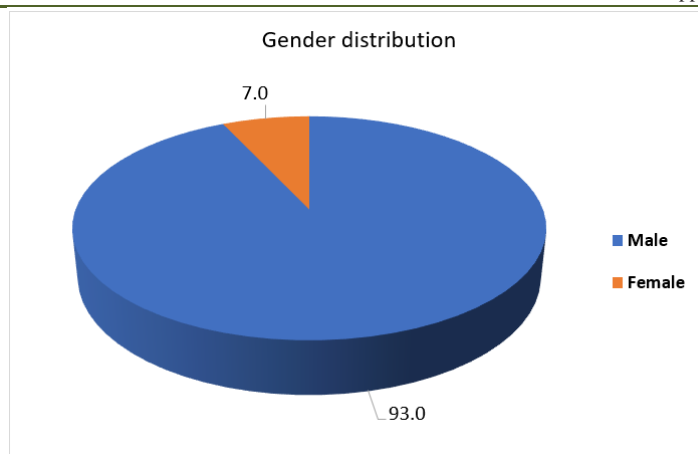


Figure-1 Pie diagram showing the sex distribution in two groups

Figure-1 shows that most of the patients (93%) were male and 7% were female.

Table II: Comparison of wound Infection between two groups on 7th postoperative day

| Wound Infection | Group | | p value |
|-----------------|---|---|---------|
| | Group A (Peritoneal lavage with povidone-iodine based normal saline) (n = 50) | Group B (Peritoneal lavage with normal saline) (n = 50) | |
| Present | 8(16%) | 18(36%) | 0.042 |
| Absent | 42(84%) | 32(64%) | |

Data were analyzed using Chi-square test and level of significance was < 0.05.

In group-A 8 patient developed wound infection and in group-B 18 patient developed wound infection.

Wound infection in group-A and group-B was statistically significant ($p = 0.042$).

Table III: Distribution of features of sepsis among two groups on 7th postoperative day

| Features of sepsis | Group | | p value |
|---|---|---|---------|
| | Group A (Peritoneal lavage with povidone-iodine based normal saline) (n = 50) | Group B (Peritoneal lavage with normal saline) (n = 50) | |
| Hyperthermia (>100° F) | 5 (10.0%) | 12(24.0%) | 0.062 |
| Hypothermia (<96° F) | 0(0.0%) | 2(4.0%) | 0.153 |
| Tachycardia (>90 beats per minute) | 5(10.0%) | 14(28.0%) | 0.022 |
| Tachypnea (>20 breaths per minute) | 0(0.0%) | 3(6.0%) | 0.079 |
| Leukocytosis (>12x10 ⁹ /liter) | 5(10.0%) | 11(22.0%) | 0.102 |
| Leukopenia (<4x10 ⁹ /liter) | 0(0.0%) | 3(6.0%) | 0.079 |

Data were analyzed using Chi-square test and level of significance was < 0.05.

In Group A, 5 patients exhibited a combination of hyperthermia, tachycardia, and leukocytosis. Conversely, in group B, there were varying presentations: 12 patients with hyperthermia, 2 patients with hypothermia, 14 patients with tachycardia, 3

patients with tachypnea, 11 patients with leukocytosis, and 3 patients with leukopenia. So, in this study features of sepsis were more common in Group B. Tachycardia was statistically significant ($p = 0.022$) between two groups.

Table IV: Comparison of sepsis between two groups on 7th postoperative day

| Sepsis | Group | | p value |
|---------|---|---|---------|
| | Group A (Peritoneal lavage with povidone-iodine based normal saline) (n = 50) | Group B (Peritoneal lavage with normal saline) (n = 50) | |
| Present | 5(10%) | 14(28%) | 0.0414 |

| | | | |
|--------|---------|---------|--|
| Absent | 45(90%) | 36(72%) | |
|--------|---------|---------|--|

Data were analyzed using Chi-square test and level of significance was < 0.05 .

In group-A 5 patients were presented with sepsis and 45 patients presented without sepsis. In group-B 14 patients were presented with sepsis and 36 patients

presented without sepsis. There was significant difference of sepsis in between two groups ($p = 0.0414$).

Table V: Comparison of intra-abdominal abscess between two groups

| Intra-abdominal abscess | Group | | p value |
|-------------------------|---|---|---------|
| | Group A (Peritoneal lavage with povidone-iodine based normal saline) (n = 50) | Group B (Peritoneal lavage with normal saline) (n = 50) | |
| Present | 2(4%) | 3(6%) | 0.6464 |
| Absent | 48(96%) | 47(94%) | |

Data were analyzed using Chi-square test and level of significance was < 0.05 .

In group-A 2 patients developed Intra-abdominal abscess and group-B 3 patients developed Intra-abdominal abscess. Other patients (95) of both

groups not developed Intra-abdominal abscess. The difference of Intra-abdominal abscess between two groups was not statistically significant ($p = 0.6464$).

Table VI: Comparison of hospital stay between two groups

| Postoperative hospital stay (day) | Group | | p value |
|-----------------------------------|---|---|---------|
| | Group A (Peritoneal lavage with povidone-iodine based normal saline) (n = 50) | Group B (Peritoneal lavage with normal saline) (n = 50) | |
| <7 | 7(14%) | 7(14%) | 0.0173 |
| 7-10 | 39(78%) | 33(66%) | |
| 11-14 | 3(6%) | 7(14%) | |
| >14 | 1(2%) | 3(6%) | |
| Mean \pm SD | 7.92 \pm 1.88 | 9.10 \pm 2.89 | |

Data were analyzed using Student t-test and level of significance was < 0.05 .

The mean duration of hospital stay in group A was 7.92 \pm 1.88 days and in group B was 9.10 \pm 2.89 days. The difference of hospital stay between two groups was statistically significant ($p = 0.0173$).

DISCUSSION

Duodenal ulcer perforation is a common surgical emergency which allows escape of gastric and duodenal contents into the peritoneal cavity with a resulting initial chemical peritonitis. If there is continuing leakage of gastro duodenal contents bacterial contamination of the peritoneal cavity occur, which causes peritonitis.

So, general supportive measures such as maintenance of hydration, correction of electrolytes imbalance were important steps in the management of patients with peritonitis.

Despite all advances in surgical field these patients still have a significant post-operative complication rate contributing to morbidity and mortality. Peritoneal lavage is essential step in surgery for perforation peritonitis. Choice of fluid used for

lavage can have an effect on postoperative complication [9].

In this study, the effect of povidone-iodine based normal saline lavage was compared to warm normal saline lavage in duodenal ulcer perforation.

A total of 100 patients who presented with features of peritonitis secondary to Duodenal ulcer perforation underwent laparotomy at DMCH, Dhaka from January 2021 to December 2022 were in two groups and studied.

In Group-A, patients who received peritoneal lavage with povidone-iodine in normal saline and Group-B patients who received peritoneal lavage with only warm normal saline. All patients were selected non-randomly according to inclusion and exclusion criteria.

In this study out of 50 patients in Group-A highest number of patients 18(36%) were present in the age group of 20-30 years followed by 11(22%) were in the age group of 31-40 years. Out of 50 patients in Group-B highest number of patients 20(40%) were present in the age group of 20-30 years followed by 11(22%) were in the age group of 31-40 years. There is

no statistical difference in age between the groups ($p>0.05$). Noola and Shivakumar (2016) reported highest incidence was found in 40-49 years of age (25%) followed by 20-29 years (21.67%), 30-39 years (20%) and 50-59 years (15%) [2]. Patil, Kamthane and Reddy (2015) also reported the peak age incidence was between 40 to 49 years [10].

Majority of the patients were males (93/100). Among them 3(6%) patients were female in group-A and 4(8%) patients were female in group-B. Similarly, Rajan *et al.*, 2020 reported 8% cases of duodenal ulcer perforation were female [3]. But Noola and Shivakumar (2016) reported 5% cases of duodenal ulcer perforation were female [2]. Also Patil, Kamthane and Reddy (2015) reported only 5% cases of duodenal ulcer perforation were female [10].

In group-A 8(16%) patients were having wound infection. But in group-B 18(36%) patients were having wound infection. So there was 20% reduction in incidence of wound infection in the povidone iodine based normal saline lavage group. This difference is statistically significant with p value 0.042. Baig and Kumar (2019) reported 30% were having wound infection in povidone-iodine lavage group and 42% were having wound infection in metronidazole lavage group [11]. Similarly, Saha *et al.*, (2017) reported about 24% reduction in incidence of wound infection, when povidone-iodine solution was used for intra-operative peritoneal lavage (IOPL) [7]. That difference was also statistically significant. But Sarada (2020) *et al.*, reported 36% patients were having wound infection when povidone-iodine lavage group and 16% patients were having wound infection when metronidazole lavage group [8]. That difference was statistically significant.

In this study in group-A, 5(10%) patients were having sepsis. But in group-B 14(28%) patients were having sepsis. In this study, there was 18% reduction in incidence of sepsis in the povidone iodine based normal saline lavage group. This difference is statistically significant with p value 0.0414. Choudhary and Dhankhar (2018) reported 20% were having sepsis when metronidazole in normal saline was used for peritoneal lavage and 30% were having sepsis in saline lavage group [12]. Similarly, Sulli and Rao (2016) reported 10% reduction in incidence of sepsis, when metronidazole was used for intra-operative peritoneal lavage [5].

In group-A 2(4%) patients were having intra-abdominal abscess. But in group-B 3(6%) patients were having intra-abdominal abscess. So there was 2% reduction in incidence of intra-abdominal abscess in the povidone iodine based normal saline lavage group. However, this is not statistically significant with p value 0.6464. Similarly, Sarada *et al.*, (2020) reported 2% patients were having intra-abdominal abscess both in povidone-iodine and metronidazole lavage group [8]. Choudhary and Dhankhar (2018) reported 08% were

having intra-abdominal abscess when metronidazole in normal saline was used for peritoneal lavage and 10% were having sepsis in saline lavage group [12]. Sulli and Rao (2016) reported 2% reduction in the incidence of post-operative intra-abdominal abscess in the metronidazole IOPL group. That difference was not also statistically significant [5]. Meena *et al.*, (2015) reported 14.3% patients were having intra-abdominal abscess in normal saline lavage group and 0.05 patients were having intra-abdominal abscess in super oxidized solution lavage group [13].

In group-A the mean hospital stay was 7.92 ± 1.88 and in group-B mean hospital stay was 9.10 ± 2.89 . So in this stay, there was shorter hospital stay in the povidone iodine based normal saline lavage group. This difference is statistically significant with p value 0.0173. Similarly, Saha *et al.*, (2017) reported shorter hospital stay in povidone-iodine lavage group [7]. That difference was also statistically significant ($p=0.045$). Gupta *et al.*, (2022) reported shorter hospital stay in metronidazole group and the difference was statistically significant ($p=0.0019$) [9]. But Sarada *et al.*, (2020) reported the duration of hospital stay in the povidone-iodine lavage group was 9.44 ± 1.48 days, whereas in the metronidazole lavage group was 9.36 ± 1.17 days [8]. That difference was not significant.

CONCLUSION

In this study, in povidone-iodine based normal saline lavage group, there was significant reduction in postoperative wound infection, sepsis and hospital stay. So this study concluded that povidone-iodine based normal saline was better than only normal saline lavage in duodenal ulcer perforation in terms of wound infection, sepsis and hospital stay.

REFERENCE

1. Lunevicius, R. & Morkevicius, M., (2005). Management strategies, early results, benefits, and risk factors of laparoscopic repair of perforated peptic ulcer. *World Journal of Surgery*, 29, pp.1299-1310.
2. Noola, G.S. & Shivakumar, C.R., (2016). A clinical study of duodenal ulcer perforation. *International Surgery Journal*, 3(2), pp.711-713.
3. Rajan, S.P., UK S, S. & Dinesh, B.M.V. (2020). Clinical Study on Patients with Duodenal Perforation. *Academic Journal of Surgery*. 3(1), pp. 71-74.
4. Bertleff, M.J. & Lange, J.F., (2010). Perforated peptic ulcer disease: a review of history and treatment. *Digestive surgery*, 27(3), pp.161-169
5. Sulli, D. & Rao, M.S., (2016). Comparative study of saline versus metronidazole peritoneal lavage in operated peritonitis cases. *Journal of Evidence Based Medicine and Healthcare*, 3(31), pp.1446-1448.

6. Garg, P.K., Kumar, A., Sharda, V.K., Saini, A., Garg, A. & Sandhu, A., (2013). Evaluation of intraoperative peritoneal lavage with super-oxidized solution and normal saline in acute peritonitis. *Archives of International Surgery*, 3(1), pp.43-8.
7. Saha, H., Khalil, M.I., Islam, A., Al Mamun, A. & Hossain, M.M., (2017). Comparative Study of Efficiency between Povidone Iodine and Normal Saline Lavage in the Treatment of Acute Peritonitis. *Bangladesh Journal of Infectious Diseases*, 4(1), pp.15-20.
8. Sarada, B., Bhargavi, G., Rani, S.B. & Prakash, G.V., (2020). Comparative study of povidone iodine versus metronidazole in normal saline in peritoneal lavage in case of peritonitis. *Journal of Evidence-Based Medicine and Healthcare*, 7(34), pp.1798-1803.
9. Gupta, D.K., Gill, G.S., Goel, T., Mahajan, N. & Garg, D.K., (2022). Saline versus Metronidazole Peritoneal Lavage in Operated Cases of Peritonitis- A Longitudinal Study. *Journal of Clinical & Diagnostic Research*, 16(3), pp. 1-8.
10. Patil, R., Kamthane, S. & Reddy, P.A., (2015). A study of duodenal ulcer perforation: risk factors and prognostic determinants in BTGH, Gulbarga. *Journal of Evolution of Medical and Dental Sciences*, 4(91), pp.15657-15665.
11. Baig, A. & Kumar, K.M., (2019). A comparative study between povidone iodine and metronidazole for peritoneal lavage in cases of peritonitis. *International Surgery Journal*, 6(4), pp.1214-1218.
12. Choudhary, V. & Dhankar, A., (2018). A comparative study of peritoneal lavage with saline versus metronidazole in operated peritonitis cases. *International Journal of scientific Researce*, 7(3), pp.1-5.
13. Meena, R., Khorwal, B., Meena, A. & Yadav, K.S., (2015)a. Study of the role of per-operative peritoneal lavage with super oxidized solution in perforation peritonitis. *Journal of Evolution of Medical and Dental Sciences*, 4(105), pp.16988-16991.