

Mortality and Morbidity in Peptic Ulcer Perforation: A Comparison between Radical Open Repair vs Conservative Laparoscopic Repair

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ABSTRACT

Introduction: Currently, in the era of robotic surgery and advancement of laparoscopic technology, the place of open surgery has been reduced. However, the use of laparoscopic surgery for peptic ulcer disease is not yet a consensus.

Materials and methods: All patients who had been operated for perforated peptic ulcer (PPU) disease from January 2005 to December 2014 in our hospital were reviewed retrospectively. Patient demographics, perioperative and intraoperative details, and surgical outcomes were evaluated. The objective of our study is to compare the clinical and surgical outcomes of patients who underwent either laparoscopic or open procedure as well as to demonstrate if laparoscopic repair (LR) technique has advantages to open repair (OR) in terms of morbidity and mortality.

Results: We diagnosed 159 patients with PPU during the study period. LR was performed for 65 (41%) patients, and the remaining patients underwent OR. Morbidity of medical and surgical complication was higher in open groups (21 vs 2) (p value = 0.0001). The most frequent complication in both groups was medical complication. Overall, 16 patients in the OR group had medical complications vs 2 patients in the LR group (p value = 0.009). Surgical complication was higher in open groups (7 vs 0) (p value = 0.04). Mortality was statistically higher in the open group. We did not report any death in the laparoscopic group. However, six deaths were identified in the OR group (p value = 0.04).

Conclusion: Our results indicate that LR for PPU was a safety option with fewer rates of morbidity, reoperation, and mortality compared to OR.

Keywords: Laparoscopic repair, Morbidity, Perforated peptic ulcer.

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INTRODUCTION

Peptic ulcer is a current disease. Complications such as acute hemorrhage or perforation have been well documented.^{1,2}

Despite the progress of medical treatment [proton pump inhibitor (PPI) and eradication therapy for *Helicobacter pylori*], the incidence of perforated peptic ulcer (PPU) did not decrease.^{3,4}

Currently, in the era of robotic surgery and advancement of laparoscopic technology, the place of open surgery has been reduced.⁵

However, laparoscopic surgery for peptic ulcer disease was not yet recommended by consensus.⁶

It is for this reason that the practice is often confused, which procedure to choose to cure a patient?

In the literature, superiority of laparoscopic repair (LR) technique in PPU compared to open repair (OR) surgery was controversial.⁷

The objective of our study is to compare the clinical and surgical outcomes of patients who underwent either LR or OR.

MATERIALS AND METHODS

We retrospectively reviewed all patients who underwent surgical repair for PPU in our surgical unit from January 2005 to December 2014.

The puncture site was juxtapyloric for all patients.

The data analyzed included age, sex, American Society of Anesthesiologists (ASA) classification, operative details, details of postoperative complications, operative time, the analgesic requirement, length of postoperative, hospital stay, and return to normal daily activities. Patients with a history of previous upper

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abdominal surgery, evidence of concomitant ulcer bleeding, gastric outlet obstruction, or large and suspicious ulcers were excluded.

The goal of the study was to compare the results of PPU LR with OR.

The primary end points were morbidity specific complications (intra-abdominal, abscess; anastomosis leakage; secondary peritonitis; surgical-site infection) and nonspecific complications (urinary tract infection, pulmonary and cardiovascular complications) and mortality.

The second end point was operation time, the average duration of nasogastric tube, the average of drainage stays, the average of nasogastric tube, longer time of Foley, total analgesic dose, time to return to normal diet, and overall duration of hospitalization.

The decision regarding the method of repair (laparoscopic or open) was dependent on laparoscopic surgical skills of surgeons and anesthesiologist recommendation.

All ORs were performed using an upper midline incision.

After identification of the site of the perforation, pyloroplasty with radical vagotomy was done. Thorough peritoneal toilet was done. Finally, the drain was left.

In LR, the patient was placed in supine position and legs spread with reverse Trendelenburg tilt. The operating surgeon stood between the patient's thighs. The open method was used for insertion of the initial 10 mm umbilical port. A 30° laparoscope was then introduced. Three additional working ports were inserted at the level of the trans-pyloric plane at the midclavicular line on both sides and the third ports in mid-epigastrium.

First, we started by peritoneal cavity exploration and searched meticulously the perforation of pyloroduodenal region.

Second, we sutured the ulcer perforation using dissolving suture (2.0) with intracorporeal stitch and finally laparoscopic lavage was done.

All statistical analyses were performed using the statistical package SPSS version 15.0 for Windows.

Categorical variables were described using frequency distributions, and continuous variables with descriptive statistics were calculated and reported as mean ± SD (if distribution was normal) or median with range (if distribution was skewed). For statistical analysis, Student *t* test was used to compare means of numerical variables. Pearson chi-square test was used for nominal variables, and Fisher's exact test was used in instances with low expected frequencies. A *p* value < 0.05 was accepted as statistically significant.

RESULTS

From January 2005 to December 2014, a total of 159 patients were diagnosed with PPU during the study period.

There were 143 (90%) males and 16 (10%) female patients. The mean patient age was 41 years (range, 19–88 years).

Fifty-nine (59%) patients were found to have free gas under the diaphragm on an erect chest X-ray.

Thirteen (7.6%) of the patients had a known history of PPU.

Twenty-eight (16.4%) patients had a history of non-steroidal anti-inflammatory drugs (NSAIDs) intake.

LR was performed for 65 (41%) patients, and the remaining patients underwent open repair (Flowchart 1).

Among the 94 (59%) patients who underwent direct open surgery, 9 of them had unstable hemodynamic at presentation.

There were no conversions in the laparoscopic groups.

The demographics and characteristics of the patient's populations in the LR and OR group are summarized in (Table 1).

There were no significant differences in baseline characteristics between the groups in terms of gender, American Society of Anesthesiologists (ASA) physical status score, comorbidities,

temperature, and white cell count (WCC) on presentation. Patients with shock at presentation were included only in the OR group.

Operative details for LR and OR groups are presented in (Table 2).

The mean operative time for LR was (151 minutes), significantly shorter than OR (216 minutes) (*p* value = 0.0001).

The average of nasogastric tube duration was shorter in LR group (mean, 3 days vs 4 days) (*p* value = 0.0001) as well as the average of drainage stay (mean, 2 days vs 3 days) (*p* value = 0.007), and Foley catheter had been maintained for longer time in the OR group (3 vs 2 days) (*p* value = 0.001).

Analgesic postoperative time was longer for the OR group (5 days) than for the LR group (4 days) (*p* value = 0.001). Postoperative pain was well controlled using oral paracetamol alone in all the patients with LR, whereas two patients in the OR group required oral tramadol for pain control and one required intramuscular opioids. In addition, patients who had LR were able to return to normal diet and full mobilization significantly earlier if they had undergone LR. All these factors enabled these patients to be discharged significantly earlier from the hospital.

Morbidity of medical and surgical complication was higher in open groups (21 vs 2) (*p* value = 0.0001) (Table 3).

The most common complication in both groups was medical complication. Overall, 16 patients in the OR group had medical complications such as respiratory, cardiovascular, and postoperative sepsis vs 2 patients in the laparoscopic group (*p* value = 0.009).

More cases of pneumonia occurred in OR group compared to LR group (3 vs 1 case), respectively, but this was not statistically significant (*p* value = 0.64).

Table 1: Comparison of patient demographics and admission characteristics between laparoscopic and open repair groups

	Open	Laparoscopic	<i>p</i>
Mean age (y)	45	36	0.001
Sex			0.1
Male	82	61	
Female	12	4	
ASA	69	58	0.6
I	24	7	
II	1	0	
III	1	0	
IV			
Temperature (°C)	38	38.5	0.9
WCC (×10 ⁹)	16.438	16.620	0.8

ASA, American Society of Anesthesiologists Physical Status Classification 2014; WCC, white cell count

Flowchart 1: Flow diagram showing inclusion and exclusion of studies

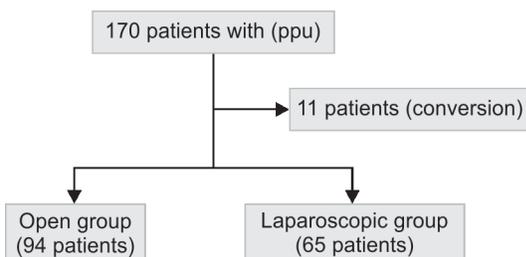


Table 2: Preoperative data of the laparoscopic and open patient cohorts

	Open	Laparoscopic	<i>p</i>
Operative time (min)	216	151	0.0001
NG tube utilization (days)	4	3	0.0001
Abdominal drain usage (days)	2	3	0.007
Urinary catheter usage (days)	3	2	0.001
Time to resume normal diet (days)	2	1	0.001
Time to oral analgesia (days)	5	4	0.001
Time to full mobilization (days)	3	1	0.0001
Hospital stay (days)	4	1.5	0.0001

Table 3: Surgical outcomes of laparoscopic and open repair group

	Open	Laparoscopic	p
Leaks	3	0	0.2
Wound infection	2	0	0.5
Intra-abdominal abscess	2	0	0.5
Pneumonia	3	1	0.64
Cardiovascular	4	0	
UTI	2	0	0.51
Sepsis	7	0	
Overall morbidity	21	2	0.0001
Medical complication	16	2	0.009
Surgical complication	7	0	0.04
Mortality	6	0	0.04

UTI, urinary tract infection

Specific complication (surgical complication) was higher in OR group (7 cases vs 0) (p value = 0.04). There were two patients in our series who had intra-abdominal abscess postoperatively only in the OR group and no case from the LR group. Intravenous antibiotics and percutaneous drainage with a good clinical outcome managed intra-abdominal abscess.

Two patients had a surgical site infection in the OR group and none from the laparoscopic group. Revision surgery for suture site leakage occurred in three patients in the OR groups vs none in the laparoscopic groups.

Mortality was statistically higher in the OR group. There was no death in the LR group, while 6 deaths were recorded in the OR group (p value = 0.04).

Correlation analysis was done between mortality and shock on presentation, and it was statistically significant (p value = 0.001) but had no correlation between mortality and laparotomy (p value = 0.06).

DISCUSSION

In this present study, LR was associated with a shorter operative time (p value = 0.0001), reduced analgesic requirements (p value = 0.01), a shorter hospital stay (p value = 0.001), and earlier return to normal daily activities compared to open repair. Concerning morbidity, it was low in LR group compared to open groups (p value = 0.0001).

Effectively, laparoscopic procedure was associated with fewer medical complications (p value = 0.009) compared to open repair.

No postoperative surgical complications in the LR group, such as abscesses, wound infection, or revision surgery, occurred compared to the OR group (p value = 0.04).

Mortality was statistically higher in the OR group (6 vs 0) (p value = 0.04). In our practice, patients with shock does not receive LR. Correlation analysis was done between mortality and shock on presentation, and it was statistically significant (p value = 0.001) but had no significant correlation between mortality and laparotomy (p value = 0.06).

Therefore, this result was due of the selection bias of patients having shock at presentation.

Therefore, mortality was related to shock on presentation and not to surgical technique.

Several studies have shown results similar to our study. In fact, some authors report that laparoscopic approach has several benefits such as confirmation of the diagnosis and⁸⁻¹² shorter operative time,

reduced postoperative pain and analgesic requirements, a shorter hospital stay, and an earlier return to normal daily activities.

The recent study of Siow et al.,⁵ including 131 patients who underwent emergency repair for PPU (LR, $n = 63$, 48.1% vs OR, $n = 68$, 51.9%) have demonstrated that LR group had fewer complications compared to the OR group (p value = 0.005). When considering specific complications, the incidence of surgical site infection was statistically significant (p value = 0.003). The LR group had a significantly shorter mean hospital stay (p value = 0.008) and reduced postoperative pain (p value < 0.05). However, mortality was similar in both the groups (p value < 0.99).

The meta-analysis study of Zhou et al.,¹² including nonrandomized controlled studies (NRS) and five randomized controlled trails (RCTs), demonstrated a lower mortality rate in the LR group in NRS. However, in the analysis of five RCTs, the mortality was the same in both groups.

In the randomized controlled study reported by Siu et al.,⁸ 130 patients with a clinical diagnosis of PPU were randomly assigned to undergo either open or laparoscopic omental patch repair and showed that the complication rate for LR was low.

However, some authors showed that LR compared to open abdominal surgery for peptic ulcer disease was not superior and may even have worse outcomes, including longer operative time. In addition, open abdominal surgery provides efficient and easy training without the constraints and difficulties for young surgeons.^{9,13}

On the other hand, some study found that LR and OR was equal. Indeed, in the meta-analysis of RCTs published by Tan et al.,¹³ LR had similar operative time as OR for PPU (WMD: 9.15, 95% CI: -1.83 to 20.12, p value > 0.05) and the same postoperative hospital stays, yet LR had shorter nasogastric tube duration than OR for PPU, similar time to resume diet as OR, and the mortality was similar in both the groups (p value > 0.05).

Cochrane report,⁷ concerning three randomized clinical trials, found no statistically significant differences between LR and OR in the abdominal septic complications (OR 0.66; 95% CI 0.30-1.47) and pulmonary complications (OR 0.43; 95% CI 0.17-1.12).

In a recent study published by Wang et al.,¹⁴ including 119 patients operated for PPU, no significant differences were found in operation time, morbidity of postoperative complication, and mortality. The authors concluded that LR was preferable for treating PPU than OR; nevertheless, some preventive action must be taken to avoid the risk of postoperative leak in perforation site.

Our results indicate that LR for PPU was feasible and safe option with fewer rates of morbidity, reoperation, and mortality compared to OR. It can be considered as a treatment of choice. Nevertheless, certain limitations apply to the current study. First, the study was retrospective by nature. A selection bias of patients having shock at presentation was included only in the open groups. Therefore, this could explain the high rates of mortality in OR compared to LR groups.

In conclusion, our series ensures that the LR became a gold standard in PPU. Therefore, we need more randomized prospective trial.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This work had been made with all due respect to the code of ethics under the supervision of the medical and ethics committee of the Salah Azaiez Institute.

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