

ORIGINAL RESEARCH**A Study Comparing Peptic Perforation Repair Open Versus Laparoscopic Surgery**¹Dr. Ajay Kothari, ²Dr. Divya Kothari¹Assistant Professor, Dept. of General Surgery, Geetanjali Medical College and Hospital, Udaipur, Rajasthan, India²Assistant Professor, Dept. of Obstetrics and Gynaecology, Geetanjali Medical College and Hospital, Udaipur, Rajasthan, India**Corresponding author**

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ABSTRACT**Background**

Perforated peptic ulcers (PPUs) is related with short-term mortality and morbidity in up to 30 and 50% of peptic ulcer patients, respectively, due to subsequent peritonitis and sepsis. Immediate surgery is the most important aspect of treatment since delay in surgery considerably increases mortality. We conducted this study with an aim to compare the intraoperative findings and postoperative outcomes of cases undergoing open repair surgical approach and laparoscopic repair surgical approach for PPUs.

Methods

We conducted this retrospective study in the department of General Surgery at the tertiary care hospital, North India 3 months (June 2021 to August 2021). The cases of both gender (age 15-70 years) with criteria of clinical diagnosis and radiological evidence of perforated peptic ulcer were the study subjects [treated with open repair method (n=90) or laparoscopic repair method (n=160)]. In our hospital, a thorough clinical examination was performed in all patients with PPU. A pretested proforma was designed to collect the details of cases from the patient case sheet. The collected data was entered in MS Excel sheet and was analysed using the same. Tests were considered significant if $p > 0.05$.

Results

In present study, the cases underwent open and laparoscopic repair were matched for the gender, age, body mass index, comorbidity, and ASA score for comparing the outcomes of open and laparoscopic repair of the PPU. In our study, the operative time was significantly higher in cases whose PPU was repaired with laparoscopic method (111.62 ± 31.89 min) as compared to the cases who underwent open repair technique (87.46 ± 28.95 min). In our study, the surgical site infection (SSIs) rates were higher in open repair group (14.4%) as compared to the laparoscopic repair group (5.6%). In our study, the mortality rates were higher in open repair group (3.3%) as compared to the laparoscopic repair group (0.0%).

Conclusion

A common surgical emergency is a perforated peptic ulcer. In order to repair the defect and flush the peritoneal cavity, patients with perforated peptic ulcer disease typically need emergency surgery. Fewer postoperative complications including a lower rate of surgical site infection and lower mortality are advantages of laparoscopic surgery versus open surgery.

Keywords: Perforation, hollow viscus, retrospective, ulcers, emergency

INTRODUCTION

The second most common reason for abdominal perforations and the main factor in requiring emergency gastric surgery are perforated peptic ulcers (PPUs) [1]. Perforation is related with short-term mortality and morbidity in up to 30 and 50% of peptic ulcer patients, respectively, due to subsequent peritonitis and sepsis [2]. Immediate surgery is the most important aspect of treatment since delays in surgery considerably increase mortality [3].

For decades, experts have debated the appropriate surgical strategy for effectively treating this condition [4]. Strong guidelines, however, have not yet been able to be developed [5]. The first description of laparoscopic PPU repair appeared in the 1990s. With sufficient peritoneal lavage, laparoscopy enables minimally invasive detection and closure of the lesion without the disadvantages of an upper laparotomy [6]. Laparoscopic repair has several advantages, including less postoperative discomfort and painkiller usage, shorter recovery rates, and

less wound infections [7]. The need to switch from a laparoscopic to an open surgical procedure is present in a non-negligible number of patients. Others, however, require primary open surgery as they are either not fit for laparoscopy or the surgeons are not comfortable with this minimally invasive procedure [8].

We conducted this study with an aim to compare the intraoperative findings and postoperative outcomes of cases undergoing open repair surgical approach and laparoscopic repair surgical approach for PPU.

MATERIALS and METHODS

We conducted this retrospective study in the department of General Surgery at the tertiary care hospital, North India after obtaining the ethical approval from the ethical committee for 3 months (June 2021 to August 2021). The subjects in our study were the PPU cases who were operated between March 2019 to February 2021 at a tertiary care hospital. The cases of both gender (age 15-70 years) with criteria clinical diagnosis and radiological evidence of perforated peptic ulcer were the study subjects. The complicated ulcers like bleeding ulcer, ulcer situated over posterior wall, clinically sealed perforation, patients with abdominal malignancy, hemodynamically unstable (Systolic Blood pressure < 80 mm Hg), delay between onset of symptoms and presentation > 24 hours, patients with COPD, heart disease, coagulopathy, obesity, cirrhosis, and advanced pregnancy were excluded from the study. So, a total of 250 cases of PPU cases were included in the study considering inclusion and exclusion criteria either treated with open repair method (n=90) or laparoscopic repair method (n=160). Informed consent for this study was waived because of its retrospective nature.

In our hospital, a thorough clinical examination was performed in all patients with PPU. The choice of laparoscopic versus open repair was at the surgeon's discretion. Patients were also subjected to routine blood investigations such as complete blood count, total leukocyte count, differential count, platelet count, blood grouping and random blood sugar level. Renal function tests, serum creatinine and urine tests were also performed. X-ray erect abdomen was taken. The conversion criteria for laparoscopy to open repair was non juxta pyloric gastric ulcer, ulcer > 10 mm in size, technical difficulties, concomitant haemorrhage and hemodynamic instability during laparoscopic repair.

A pretested proforma was designed to collect the details of cases from the patient case sheet, such as age, gender, comorbidities, body mass index (BMI), American Society of Anaesthesiology (ASA) scores, location and diameter of perforation, Mannheim Peritonitis Index (MPI), operation time, VAS scores (4th and 24th hour), oral intake, flatus, length of hospital stay, postoperative complications and mortality.

Statistical analysis

The collected data was entered in MS Excel sheet and was analysed using the same. The data was presented as frequency and percentage for categorical variables and it was presented as mean and SD for the continuous variables. Unpaired T-tests and Chi-square tests were used to compare the operative and intraoperative parameters in open repair group and laparoscopic repair group. Tests were considered significant if $p > 0.05$.

RESULTS

In present study, the male cases of PPU were more than four fifth in both who underwent open repair (82.2%) and laparoscopic repair (85.6%). The mean age of cases which underwent open repair for PPU was 46.42 ± 16.23 years, while those underwent laparoscopic repair 28.73 ± 3.12 years. The cases underwent open and laparoscopic repair were matched for the gender, age, body mass index, comorbidity, and ASA score (Table 1) for comparing the outcomes of open and laparoscopic repair of the PPU.

Table 1. Baseline characteristics of the patients in the laparoscopic repair and open repair groups.

Baseline characteristics*	Open repair group	Laparoscopic group
	(n=90)	(n=160)
	Frequency(%) / Mean \pm SD	
Gender		
Male	74 (82.2)	137 (85.6)
Female	16 (17.8)	23 (14.4)
Age (in years)	46.42 ± 16.23	42.51 ± 15.29
Body mass Index (in Kg/m²)	27.92 ± 3.03	28.63 ± 3.12
Comorbidity		
No	57 (63.3)	116 (72.5)
Yes	33 (36.7)	44 (27.5)
Charlson comorbidity index (SD)	2.71 ± 0.53	2.63 ± 0.41
ASA Score		
1	17 (18.9)	22 (13.8)
2	38 (42.2)	89 (55.6)
3	27 (30.0)	40 (25.0)
4	8 (8.9)	9 (5.6)

* $p > 0.05$

During operative procedure, the location of the PPU in cases of open group was post-pyloric and pre-pyloric in 80.0% and 20.0% of cases respectively and the location of the PPU in cases of laparoscopic group was post-pyloric and pre-pyloric in 76.3% and 23.7% of cases respectively. During operative procedure, the size of the PPU in cases of open group was >1 cm and 1 cm or less in 45.6% and 54.4% of cases respectively and the size of the PPU in cases of laparoscopic group was >1cm and 1 cm or less in 34.4.% and 65.6% of cases respectively. The operative time and the volume of lavage was significantly higher in cases whose PPU was repaired with open technique as compared to the cases who underwent laparoscopic repair (Table 2).

Table 2. Intra-operative characteristics of the patients in the laparoscopic repair and open repair groups.

Intraoperative characteristics	Open repair group	Laparoscopic group
	(n=90)	(n=160)
Frequency(%) / Mean±SD		
Location of perforation		
Post-pyloric	72 (80.0)	122 (76.3)
Pre-pyloric	18 (20.0)	38 (23.7)
Size of perforation		
>1 cm	41 (45.6)	55 (34.4)
1 cm or less	49 (54.4)	105 (65.6)
Mannheim Peritonitis Index (MPI)	17.70±5.15	16.47±5.72
Volume of lavage (in ml)*	2923.38±1496.87	1932.51±947.26
Operating time (in min)*	87.46±28.95	111.62±31.89

*p<0.0001

The VAS score at 24th hour among cases in open repair group was 4.64±1.42 and laparoscopic repair group was 3.31±1.21. The beginning of oral intake among cases in open repair group was 1.63±1.01 days and in laparoscopic repair group was 1.13±0.31 days. The beginning of flatus took 3.02±1.37 days in open repair group and 1.94±0.79 days in laparoscopic repair group. The length of hospital stay was 5.72±6.89 days in open repair group and it was 3.51±1.34 days in laparoscopic repair group. Overall, 3 cases of mortality were observed in this study among cases who underwent open repair (3.3%) for PPU (Table 3).

Table 3. Post-operative characteristics of the patients in the laparoscopic repair and open repair groups.

Intraoperative characteristics	Open repair group	Laparoscopic group
	(n=90)	(n=160)
Frequency(%) / Mean±SD		
VAS score at 4th hour#	5.45±1.39	5.32±1.36
VAS score at 24th hour##	4.64±1.42	3.31±1.21
Beginning of oral intake (in days)*	1.63±1.01	1.13±0.31
Beginning of flatus (in days)*	3.02±1.37	1.94±0.79
Length of hospital stay (in days)*	5.72±6.89	3.51±1.34
Interventional drainage done		
Yes	5 (5.6)	5 (3.1)
No	85 (94.4)	155 (96.9)
Re-operation done[§]		
Yes	8 (8.9)	4 (2.5)
No	82 (91.1)	156 (97.5)
Mortality[§]		
Yes	3 (3.3)	0 (0.0)
No	87 (96.7)	160 (100.0)

#VAS: Visual Analog Scale, *p<0.0001, §p<0.05

Overall complication rate among cases in open group was 27.8% and in laparoscopic repair group it was 8.1%. Among open repair group, the superficial wound infection (14.4%) and pulmonary complications (10.0%) were the most common complications, while in laparoscopic repair group the superficial wound infection (5.6%) and intraabdominal abscess (3.1%) were the most common complications.

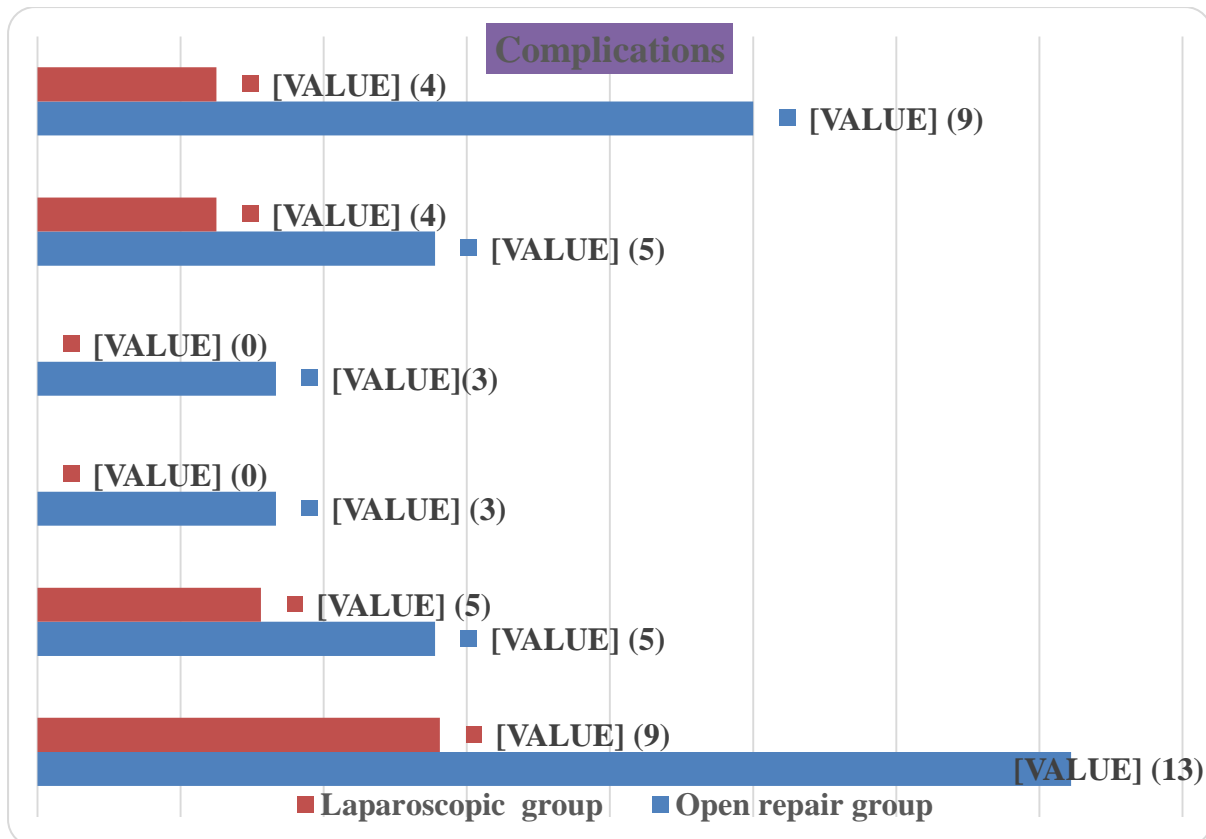


Figure1. Post-operative complications among patients with laparoscopic repair and open repair groups.

But in contrast to the present study, the studies by Schietromaet al., (16)(laparoscopic: 54.3 ± 15.8 min vs open repair: 57.8 ± 17.8 min), Ge et al., (12)(laparoscopic: 70.0 ± 7.5 min vs open repair: 75.0 ± 7.5 min) and Siu et al., (10)(laparoscopic: 42.0 ± 25.1 min vs open repair: 52.3 ± 24.8 min) have reported more operative open repair as compared to laparoscopic repair for PPU [13,14,15]. A possible explanation for longer operative time is that laparoscopic suturing is more demanding especially if the edges of the perforation are infiltrated and friable. Another reason for increase in operative time is the irrigation procedure. Irrigating through a 5 mm or even a 10 mm trocar is time consuming and suction of fluid decreases the volume of gas and reduces the pneumoperitoneum.

In our study, the VAS score at 24th hour among cases in open repair group was significantly higher (4.64 ± 1.42) as compared to laparoscopic repair group (3.31 ± 1.21). A similar observation was noticed in the studies by Bertleffet al., (laparoscopic: 1.0 ± 0.9 vs open repair: 1.6 ± 0.9), and Geet al., (laparoscopic: 0.7 ± 0.3 vs open repair: 1.0 ± 0.4), where postoperative VAS score was high in open repair group of patients as compared to those operated laparoscopically [9,14]. But in contrast to the present study, the study by Siu et al., (laparoscopic: 1.4 ± 3.5 vs open repair: 1.3 ± 6.4) showed higher VAS score among laparoscopic group as compared to open repair group [15].

In our study, the length of hospital stay post-operatively was more in open repair group (5.72 ± 6.89 days) as compared to the laparoscopic repair group (3.51 ± 1.34 days). Other studies by Siu et al., (laparoscopic: 6.0 ± 7.8 days vs open repair: 7.0 ± 8.8 days), Bertleffet al., (laparoscopic: 6.5 ± 6.9 days vs open repair: 8.0 ± 5.4 days), Schietroma et al., (laparoscopic: 8.1 ± 3.8 days vs open repair: 13.8 ± 2.5 days), Siowet al., (laparoscopic: 4.4 ± 3.3 days vs open repair: 7.3 ± 7.8 days), Ibrahim et al., (laparoscopic: 3.6 ± 0.9 days vs open repair: 4.2 ± 1.2 days) and Srivastava et al., (laparoscopic: 8.4 ± 0.7 days vs open repair: 12.1 ± 2.8 days) have also shown are in agreement as the length of hospital stay post-operatively was more in open repair group as compared to the laparoscopic repair group [9,10,11,12,13,15].

In our study, the surgical site infection (SSIs) rates were higher in open repair group (14.4%) as compared to the laparoscopic repair group (5.6%). Other studies by Siu et al., (laparoscopic: 1.6% vs open repair: 5.2%), Bertleffet al., (laparoscopic: 3.8% vs open repair: 6.1%), Schietroma et al., (laparoscopic: 17.2% vs open repair: 40.3%), Siowet al., (laparoscopic: 0.0% vs open repair: 13.2%), and Geet al., (laparoscopic: 1.7% vs open repair: 3.8%), have also shown are in agreement as the length of hospital stay post-operatively was more in open repair group as compared to the laparoscopic repair group; whereas study by Srivastava et al., (laparoscopic: 0.0% vs open repair: 0.0%) have also shown no difference in the SSIs in open repair group and laparoscopic repair group [9,10,12,13,14].

In our study, the mortality rates were higher in open repair group (3.3%) as compared to the laparoscopic repair group (0.0%). Other studies by Siu et al., (laparoscopic: 3.1% vs open repair: 12.1%), Bertleff et al., (laparoscopic: 0.0% vs open repair: 8.2%), Byrge et al., (laparoscopic: 0% vs open repair: 6.0%), and Siow et al., (laparoscopic: 1.6% vs open repair: 2.9%), have also shown are in agreement as the length of hospital stay post-operatively was more in open repair group as compared to the laparoscopic repair group; whereas study by Geet et al., (laparoscopic: 1.7% vs open repair: 1.6%), and Ibrahim et al., (laparoscopic: 0.0% vs open repair: 0.0%), have also shown no difference in the mortality rates in open repair group and laparoscopic repair group [9,10,11,14,15,16].

CONCLUSION

A common surgical emergency is a perforated peptic ulcer. In order to repair the defect and flush the peritoneal cavity, patients with perforated peptic ulcer disease typically need emergency surgery. Less intraoperative time, less postoperative discomfort, fewer postoperative complications including a lower rate of surgical site infection, shorter hospital stay, and lower mortality are advantages of laparoscopic surgery versus open surgery.

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