

Laparoscopic Vs Open Closure of Duodenal Perforation

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Abstract

Introduction: Perforation is the second most common complication of peptic ulcer. Over 20% of the patients over the age of 60 years old presenting with perforated peptic ulcer are taking NSAID at the time of perforation. Perforated gastric ulcer results in a higher mortality rate than the perforated duodenal ulcer. Up to 80% of perforated duodenal ulcers are Helicobacter pylori positive. Treatment for perforated ulcer ranges from conservative treatment (Taylor's approach) to radical surgery (vagotomy, gastrectomy). The surgical technique most often used is closure of the perforation combined with extensive peritoneal lavage. Repair of duodenal perforation by Graham patch plication represents an excellent alternative approach. Laparoscopic repair of duodenal perforation is a useful method for reducing hospital stay, complications and return to normal activity. Treatment for perforated ulcer can be performed laparoscopically in 85% of cases, making it possible to avoid a median laparotomy which can lead to wound infection and late incisional hernia. *Aim and Objectives:* Comparison between open closure of PPU and laparoscopic closure of PPU on the basis of day of the oral start of the feed, day of drain removal and pain score (VAS) on the 5th day. *Material and Methods:* The present prospective study was carried out in Dept. of surgery in Govt. Medical College and hospital, Aurangabad from December 2012 to November 2014. In this study, total 30 patients of perforated peptic (duodenal) ulcer with perforation peritonitis admitted was included

after considering intra-operative confirmation of peptic (duodenal) perforation with exclusion and inclusion criteria. All 30 patients had first part duodenal ulcer perforation. Of total 30 patients, 15 patients were included in the laparoscopic (test) group and other 15 patients in open (control) group. *Results:* In the laparoscopic surgery group, the mean oral start of feed was on 2.64 days, while that in open surgery group was on 5.53 day. In the laparoscopic surgery group, the mean VAS score on day 5 was 1.80, while that in open surgery group was 3.40. In the laparoscopic surgery group, the mean duration of hospital stay in days was 6.73, while that in open surgery group was 12.06. *Conclusion:* We concluded that, laparoscopic suture with omental patch repair is an attractive and superior alternative to conventional open surgery with extraordinary benefits of minimally invasive surgery.

Keywords: Laparoscopic; Duodenal; Perforation; Ulcer; Laparotomy.

Introduction

Perforation is the second most common complication of peptic ulcer. As with the bleeding ulcer, NSAID and/or aspirin use have been inextricably linked with perforated peptic ulcer disease, especially in the elderly population. Over 20% of the patients over the age of 60 years old presenting with perforated peptic ulcer are taking NSAID at the time of perforation [1]. Perforated gastric ulcer results in a higher mortality rate than the perforated duodenal ulcer, due to more advanced age, increased medical comorbidities, delay in seeking medical attention and the larger size of gastric ulcers¹. Perforated duodenal ulcer is mainly a disease

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of young men but because of increasing smoking in women and use of NSAID in all the age group, now a days it is common in all adult population. Up to 80% of perforated duodenal ulcers are Helicobacter pylori positive [2]. Treatment for perforated ulcer ranges from conservative treatment (Taylor's approach) to radical surgery (vagotomy, gastrectomy). However, with the use of powerful acid-suppressing medications and the eradication of Helicobacter pylori, the need for radical surgery in emergencies has sharply declined. The surgical technique most often used is closure of the perforation combined with extensive peritoneal lavage. Repair of duodenal perforation by Graham patch plication (as was described in 1937) represents an excellent alternative approach [2]. Perforated duodenal ulcer is a surgical emergency. In 1990, Mouret et al [3]. reported the first laparoscopic sutureless fibrin glue omental patch for perforated duodenal ulcer repair. The first successful laparoscopic suture repair for perforated peptic ulcer was described by Nathanson et al. also in 1990 [4].

Laparoscopic repair of duodenal perforation is a useful method for reducing hospital stay, complications and return to normal activity [2]. Treatment for perforated ulcer can be performed laparoscopically in 85% of cases, making it possible to avoid a median laparotomy which can lead to wound infection and late incisional hernia. With better training in minimal access surgery now available, the time has arrived for it to take its place in the surgeon's repertoire [2].

Aim and Objectives

Comparison between open closure of PPU and laparoscopic closure of PPU on the basis of-

1. Day of the oral start of the feed.
2. Day of drain removal.
3. Pain score (VAS) on the 5th day.
4. Wound sepsis.
5. Hospital stay (days).

Material and Methods

After Institutional Ethical Committee approval the present prospective study was carried out in Department of surgery in Govt. Medical College and hospital, Aurangabad from December 2012 to November 2014. In this study, total 30 patients of perforated peptic (duodenal) ulcer with perforation peritonitis admitted was included after considering intra-operative confirmation of peptic (duodenal)

perforation with exclusion and inclusion criteria. All 30 patients had first part duodenal ulcer perforation. Of total 30 patients, 15 patients were included in the laparoscopic (test) group and other 15 patients in open (control) group. All patients under laparoscopic (test) group were operated by laparoscopic closure technique while that of open (control) group by open closure technique. This study was carried out to compare both methods of peptic perforation closure on the basis of day of oral start, drain removal, pain score, wound sepsis and hospital stay.

Study Population

Haemodynamically stable patients with peptic ulcer perforation of age group 20-60 years.

Exclusion Criteria

Unfit for general anaesthesia, Unstable cardio-respiratory status, previous upper abdominal surgery, Bleeding duodenal ulcer, Gastric outlet obstruction, Perforation more than 10 mm, Any concomitant disease, Shock (systolic BP < 90 mmHg), History more than 24 hrs.

History

Detailed sociodemographic and clinical history was elicited, detailed general and systemic examination was done, detailed abdominal examination was done. Along with all necessary investigations like Chest X-ray PA view- To rule out any chest pathology, X-ray abdomen standing PA view- To look for free intra-abdominal gas under the dome of the diaphragm. USG abdomen-pelvis- To look for intra-abdominal collection and to rule out any other pathology, Random blood sugar (RBS), Complete Blood Cell count (CBC), Kidney function test (KFT), Liver function test (LFT), ECG.

Initial Management (Resuscitation)

While investigating patients, resuscitation measures with crystalloid fluid were taken. Intravenous antibiotics also administered. Ryle's tube was inserted. The patient was catheterized and measured urine output is kept. With all these resuscitative measures, with investigations in hand, and diagnosis confirmed, patients was shifted to operation theater.

Laparoscopic Closure

Pneumo-peritoneum creation- Pneumoperitoneum

was created using the Open method. Laparoscopic procedure was performed using four ports. Diagnostic laparoscopy was done after pneumoperitoneum creation. Diagnostic laparoscopy was done to look for the site of perforation.

The size of perforation- with the identification of perforation site, the size of perforation was measured using -Either suction tip or by open jaw of Maryland forceps. The technique of repair- Duodenal perforation was repaired by- Simple intermittent stitches with silk 3-0 round body (one or more stitch according to the size of duodenal perforation) with omentopexy. Diagnostic laparoscopy was repeated to see for any intra-operative complication (e.g.trauma to any organ) and the abdominal drain was kept.

Drain

Single drain kept in right subhepatic space was brought in peritoneal cavity through the right mid-axillary (lumber) port incision. Ports site were closed with vicryl 0 round body.

Postoperative Recovery

Patients were monitored for their vitals and evaluated the performance of complete blood cell count, Serum electrolyte, Kidney function test, Urine output.

Postoperative pain assessment (VAS): Since postoperative day 1, pain assessment was done on

visual analog scale (VAS) measuring from the minimum of 0 to maximum of 10. Intravenous fluids and Ryle's tube aspiration continued till the appearance of bowel sounds and passage of flatus by the patient. Ryle's tube removed with the appearance of bowel sounds. Oral diet initiated after 24 hrs of observation after removal of Ryle's tube. Drain removed 24 hrs after initiation of oral diet with drain output less than 50 ml/24 hours.

Hospital stay- Patient's hospital stay from the day of admission to day of discharge was measured.

Helicobacter pylori eradication treatment was initiated in each patient at the time of discharge.

Open Closure of Perforation

All patients were opened with the midline vertical abdominal incision. Perforation closed with silk 2-0 round body with the omental patch. Peritoneal lavage was given. Right sub-hepatic drain kept and fixed. Postoperative assessment was done similar to the laparoscopic group.

Observations and Results

In our study age group of 20-60 years was selected for both laparoscopic surgery and open surgery groups.

Table 1: Distribution of cases according to age

Age-Group	Laparoscopic Surgery Group		Open Surgery Group	
	No.	%	No.	%
20-30	02	13.33%	00	00
31-40	07	45.67%	09	60.00%
41-50	04	26.67%	05	33.33%
51-60	02	13.33%	01	6.67%
Total	15	100%	15	100%
Mean \pm SD	40.60 \pm 8.61		38.98 \pm 6.35	
t-value	0.603			
P-value	P=0.551			

In laparoscopic surgery group out of 15 patients, 02 were between 20-30 years age group, 07 were between 31-40 years, 04 were between 41-50 years and 02 were between 51-60 years age group.

In open surgery group out of 15 patients, 09 were

between 31-40 years, 05 were between 41-50 years and 01 was between 51-60 years age group. The comparison between laparoscopic surgery group and open surgery group on the basis of age distribution is statistically not significant with p=0.551.

Table 2: Distribution of cases according to Gender

Gender	Laparoscopic Group		Open Surgery Group		Chi- square Value	P-value
	No.	%	No.	%		
Male	14	93.3%	14	93.3%	0.536	P=1.00
Female	01	6.7%	01	6.7%		
Total	15	100%	15	100%		

In the laparoscopic surgery group, out of total 15 patients, 14 (93.3%) were male and 01 (6.7%) was female. In the open surgery group, out of total 15 patients, 14 (93.3%) were male and 01 (6.7%) was female. The comparison between these two groups on the basis of gender distribution is statistically not significant ($p=1.00$).

In the laparoscopic surgery group, the mean oral start of feed was on 2.64 day, while that in open surgery group was on 5.53 day. The difference of mean oral start between these two groups is statistically significant ($p<0.001$).

In the laparoscopic surgery group, the mean VAS score on day 5 was 1.80, while that in open surgery

group was 3.40. The statistical difference between these two groups on the basis of VAS score is significant with $p<0.001$.

In laparoscopic surgery group, the mean drain removal was on day 3.87, while that in open surgery group was on day 7.73. The statistical difference between two groups on mean drain removal is significant ($p<0.001$).

In the laparoscopic surgery group, the mean duration of hospital stay in days was 6.73, while that in open surgery group was 12.06. The statistical difference between these two groups on mean hospital stay is significant ($p<0.001$).

Table 3: Comparison of mean oral start (days) in study groups

Group	Mean	SD	t-value	P-value
Laparoscopic Surgery Group	2.64	0.51	10.40	P < 0.001
Open Surgery Group	5.53	0.91		

Table 4: Comparison of mean pain score (VAS) on day 5 in study groups

Group	Mean	SD	t-value	P-value
Laparoscopic Surgery Group	1.80	0.56	8.19	P < 0.001
Open Surgery Group	3.40	0.51		

Table 5: Comparison of Mean Drain Removal (days) in Study Groups

Group	Mean	SD	t-value	P-value
Laparoscopic Surgery Group	3.87	0.74	11.28	P < 0.001
Open Surgery Group	7.73	1.09		

Table 6: Comparison of mean hospital stay (days) in study groups

Group	Mean	SD	t-value	P-value
Laparoscopic Surgery Group	6.73	1.09	7.58	P < 0.001
Open Surgery Group	12.06	2.49		

Table 7: Distribution of cases according to Wound Sepsis

Wound Sepsis	Laparoscopic Group NO.	%	Open Surgery Group NO.	%	Chi-square Value	P-value
YES	01	6.7%	05	33.3%	3.38	P=0.042
NO	14	93.3%	10	66.7%		
Total	15	100%	15	100%		

In the laparoscopic surgery group, the port site infection was present in 01 (6.7%) cases, while suture line infection in open surgery group was in 05 (33.3%) cases. The statistical difference between these two groups on wound sepsis is significant ($p=0.042$).

Discussion

Observations and results from our study were discussed and compared with those of other previous

studies under following headings:

Oral Start of Feed (Days)

In Siu et al. (2002) [5] study, median resume diet day was 4 in laparoscopic surgery group while that in open surgery group was 5. In Palanivelu et al. (2007) [6] retrospective study of 120 patients undergone laparoscopic omental patch closure of peptic perforation, oral fluid intake was permitted on the 2nd postoperative day in 84 patients and in others on the 3rd and 4th days. In Chung Ma et al. (2012)

[7] study, a liquid diet was started after confirming the safety of the suture site by performing upper gastrointestinal imaging by using gastrografin between days 3 and 5. The median day of commencement of soft diet was day 6. In Motewar et al. (2013) [8] study, the average time since the start of oral feeding was day 3 in laparoscopic surgery group while that in open surgery group was day 5. In our study, the mean oral feed was started on day 2.64 in laparoscopic surgery group while that in open surgery group was on day 5.53.

Drain Removal (Days)

In Palanivelu et al. (2007) [6] retrospective study of 120 patients undergone laparoscopic omental patch closure of peptic perforation, drain tube was removed on the 3rd to 5th postoperative day. Bertleff et al. (2010) [9] reported that average abdominal drain removal was on day 2.2 in laparoscopic surgery group

involving 843 patients while that in open surgery group was on day 3.8 out of total 1031 patients in various studies. In our study, mean drain removal was on day 3.8 in laparoscopic surgery group while that in open surgery group was on day 7.7.

Pain Score (Vas)

In Siu et al. (2002) [5,10] Study, the postoperative pain score on day 3 in laparoscopic surgery group was 1.6 while that in open surgery group was 3.3. In Golash et al. (2008) [11] study, mean postoperative pain score on day 3 in laparoscopic surgery group was 1 while that in open surgery group was 3.5. In Bertleff et al. (2009) [12] Study, the postoperative pain score on day 3 in laparoscopic surgery group was 2.1 while that in open surgery group was 3. In our study, postoperative mean pain score (VAS) on day 5 in laparoscopic surgery group was 1.8 while that in open surgery group was 3.4.

Table A: Pain score (vas) comparison

Sr. No.	Study	Laparoscopic	Open
1	Bertleff et al. (2009) ¹²	Day 3 = 2.1	Day 3 = 3
2	Siu et al. (2002) ⁵	Day 3 = 1.6	Day 3 = 3.3
3	Golash et al. (2008) ¹¹	Day 3= 1	Day 3= 3.5
4	Our Study	Day 3= 1.8	Day 3=3.4

Wound Sepsis

In Mehendale et al. (2002) [10] study, there was no wound sepsis in laparoscopic surgery group of 34 patients while that in open surgery group was present in 2 (6.06%) out of 33 patients. In Siu et al. (2002) [5] study, there were 2 (3.17%) patients with wound sepsis in laparoscopic surgery group of 63 patients while that in open surgery group was present in 7 (12.06%) out of 58 patients. In Palanivelu et al. (2007) [6] retrospective study of 120 patients undergone laparoscopic omental patch closure of peptic perforation, 9 patients had port site infection. In

Motewar et al. (2013) [8] study, there was 3 (4.28%) patients with wound sepsis in laparoscopic surgery group of 70 patients while that in open surgery group was present in 18 (25.71%) out of 70 patients. In Zacek et al. (2014) [14] study, there was 0 patient with wound sepsis in laparoscopic surgery group of 110 patients while that in open surgery group was present in 14 (11.7%) out of 120 patients. In our study, the port site infection was present in 01 (6.7%) cases of laparoscopic surgery group, while suture line infection in open surgery group was present in 05 (33.3%) cases.

Table B: Wound Sepsis Comparison

Sr. No.	Study	Laparoscopic (no. of cases)	Open (no. of cases)
1	Mehendale et al. (2002) ¹⁰	0	2 (6.06%)
2	Siu et al. (2002) ⁵	2 (3.17%)	7 (12.06%)
3	Motewar et al. (2013) ⁸	3 (4.28%)	18 (25.71%)
4	Zacek et al. (2014) ¹³	0	14 (11.7%)
5	Our Study	1 (6.7%)	5 (33.3%)

Hospital Stay (Days)

In Robertson et al. (2000) [15] study, the length of hospital stay in laparoscopic surgery group was 5 days while that in open surgery group was 7 days. In

Michelet et al. (2000) [10] study, the length of hospital stay in laparoscopic surgery group was 11 days while that in open surgery group was also 11 days. In Siu et al. (2002) [5] study, the median length of hospital stay in laparoscopic surgery group was 6 days while that

in open surgery group was 7 days. In Mehendale et al. (2002) [10] study, the median length of hospital stay in laparoscopic surgery group was 4 days while that in open surgery group was 9 days. In Palanivelu et al. (2007) [6] retrospective study of 120 patients undergone laparoscopic omental patch closure of peptic perforation, median hospital stay was 5.5 days. In Golash et al. (2008) [11] study, the mean length of hospital stay in laparoscopic surgery group was 4 days while that in open surgery group was 9 days. In Bertleff et al. (2009) [12] study, the median length of

hospital stay in laparoscopic surgery group was 6.5 days while that in open surgery group was 8 days. In Motewar et al. (2013) [8] study, the average time of discharge (total hospital stay) was 6.5 days in laparoscopic surgery group while that in open surgery group was 9.5 days. In Zacek et al. (2014) [14] study, the average length of hospital stay in laparoscopic surgery group was 7.7 days while that in open surgery group was 10.6 days. In our study, the mean hospital stay for laparoscopic surgery group was 6.73 days while that for open surgery group was 12.06 days.

Table C: Hospital Stay (Days) Comparison

Sr. No.	Study	Laparoscopic	Open
1	Mehendale et al. (2002) ¹⁰	4 (median)	9 (median)
2	Golash et al. (2008) ¹¹	4 (median)	9 (median)
3	Bertleff et al. (2009) ¹²	6.5 (median)	8 (median)
4	Motewar et al. (2013) ⁸	6.5	9.5
5	Zacek et al. (2014) ¹⁴	7.7	10.6
6	Our Study	6.73 (mean)	12.06 (mean)

Summary

1. In the laparoscopic surgery group, out of total 15 patients, 14 (93.3%) were male and 01 (6.7%) was female, while in the open surgery group, 14 (93.3%) were male and 01 (6.7%) was female out of total 15 patients.
2. In the laparoscopic surgery group, the mean oral start of feed was on 2.64 days, while that in open surgery group was on 5.53 day.
3. In the laparoscopic surgery group, the mean VAS score on day 5 was 1.80, while that in open surgery group was 3.40.
4. In the laparoscopic surgery group, the mean drain removal was on day 3.87, while that in open surgery group was on day 7.73.
5. In the laparoscopic surgery group, the mean duration of hospital stay in days was 6.73, while that in open surgery group was 12.06.
6. In the laparoscopic surgery group, the port site infection was present in 01 (6.7%) cases, while suture line infection in open surgery group was in 05 (33.3%) cases.

Conclusion

To conclude in a nutshell, laparoscopic suture with omental patch repair is an attractive and superior alternative to conventional open surgery with extraordinary benefits of minimally invasive surgery

such as reduced postoperative pain, lesser wound infection, Shorter hospital stay and early rehabilitation and Earlier resumption of oral feeding.

Abbreviations

1. PPU- Perforated Peptic Ulcer
2. NSAID- Nonsteroidal Anti-Inflammatory Drug
3. VAS- Visual Analog Scale
5. H2- Histamine 2
7. H-K ATPase- Hydrogen Potassium Adenosine Tri Phosphatase
11. MAO- Maximal Acid Output
12. PUD- Peptic Ulcer Disease
13. H. Pylori- Helicobacter pylori
17. APACHE- Acute Physiology and Chronic Health Evaluation
20. CRP- C- Reactive Protein

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