



A COMPARATIVE STUDY OF OPEN VS LAPAROSCOPIC DUODENAL ULCER PERFORATION CLOSURE

General Surgery

Dr. Somashekhar S N

Professor, Department of General Surgery, JJMMC.

Dr. Siddharth Gondi*

Resident, Department of General Surgery, JJMMC. *Corresponding Author

ABSTRACT

Background & Objectives: Since the past decade, there has been a drastic change in the approach to abdominal surgeries from laparotomy to laparoscopic surgery. Laparoscopy has now become the gold standard in most of the elective abdominal procedures. However, there is still a debate on the use of laparoscopic approach in emergency scenarios such as perforated duodenal ulcer. This study aims to analyze and compare the benefits, effectiveness and outcomes of open and laparoscopic surgical treatment of patients with perforated duodenal ulcer. **Methods:** This Prospective comparative study was conducted on patients in JJM Medical College from October 2020 – September 2022, with sample size of 40 patients, 20 patients undergoing Laparoscopic Graham's Omental patch repair and the other 20 patients undergoing open surgery using Graham's Omental patch repair. The data was analyzed using statistical tests. A p-value of <0.05 was considered statistically significant. **Results:** In the present study the mean age of the patients was 41.65 years with 27.5% between 51-60 years. There was no need for conversion to open surgery in the laparoscopic group. Mean operating time was 60 mins and mean hospital stay was 11.7 days for open surgery. Corresponding figures for laparoscopic procedure were 143.8 mins and 7.25 days. Post-operative complications were noted to be lower in the laparoscopy group. The mean time taken to return to work in the open group and laparoscopy group was 19.95 and 9.95 days respectively. **Interpretations & Conclusion:** This comparative study shows a better outcome and lesser morbidity with laparoscopic approach in terms of shorter hospital stay, less post-operative pain, early return to work, lesser wound infections, overall treatment time for the management of duodenal perforation.

KEYWORDS

Duodenal Ulcer perforation; Laparoscopic vs open; Management; Omental patch; Perforation; Laparoscopy

INTRODUCTION

Duodenal perforation is a common complication of duodenal ulcer. Perforated duodenal ulcer is mainly a disease of young men. Up to 80% of perforated duodenal ulcers are *Helicobacter pylori* positive. Due to the recent increase of smoking and use of nonsteroidal anti-inflammatory drugs (NSAIDs) in all the age groups, nowadays it is common in the whole adult population.

The surgical technique most often used for treatment of duodenal ulcer perforation is closure of the perforation combined with extensive peritoneal lavage. Repair of duodenal perforation by Graham patch repair represents an excellent alternative approach.

Perforated duodenal ulcer is a surgical emergency. In 1990 Mouret *et al.* reported the first laparoscopic sutureless fibrin glue omental patch for perforated duodenal ulcer repair. Surgical intervention by simple closure with or without omentoplasty is an acceptable form of treatment in most patients with duodenal perforation.

The first successful laparoscopic suture repair for perforated peptic ulcer was described by Nathanson *et al.* also in 1990^[25]. Soon after that, the laparoscopic approach became a widespread procedure. Due to its advantages of better view of the peritoneal cavity, an opportunity for thorough lavage, and avoidance of upper abdominal incision with its related complications, especially in high-risk patients, this procedure has gained popularity all over the world.

Laparoscopic repair of duodenal perforation is a useful method for reducing hospital stay and complications, and hastening 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.

The purpose of this study is to compare the feasibility, cost effectiveness and morbidity of the laparoscopic surgical closure with that of the open procedure.

METHODOLOGY

Source of data:

A total of 40 consecutive patients diagnosed with duodenal perforation in Chigateri General Hospital and Bapuji Hospital attached to JJM Medical college, Davangere were included in the study.

20 patients underwent open omental patch repair and 20 patients

underwent Laparoscopic omental patch repair.

Duration of study: 2 years (October 2020 to September 2022).

Study design: Prospective comparative study

Method of data collection: After institutional ethics committee approval and obtaining informed written consent from patients.

Inclusion criteria:

1. All patients 18 to 70 yrs of age with duodenal ulcer perforation who underwent open graham's omental patch repair or laparoscopic repair.

Exclusion criteria:

1. <18 yrs of age, >70 yrs of age
2. Immediate post operative Death due to post operative complications

Method Of Collection Of Data:

Patients included in the study as per the inclusion and exclusion criteria mentioned above were subjected to routine hematological and radiological investigations and assigned into open and laparoscopic group.

Eligible patients were assigned to open and laparoscopic surgery by randomization. Consent for conversion to open, was taken in laparoscopic group before surgery.

Closure of the duodenal perforation was carried out with omental patch in both groups under general anesthesia. Open exploratory laparotomy performed with midline vertical incision. For laparoscopic surgery four ports were used (supraumbilical 10 mm, 10 mm and 5 mm in the left and right midclavicular line respectively, 5 mm in sub-xiphoid position for liver retraction). Pneumoperitoneum created either by open (Hasson technique) or closed technique (Veress needle). Thorough peritoneal lavage was given in all cases. Post operative analgesia was continued using iv tramadol and pain assessment was done using VAS scoring.

The postoperative hospital stay, drain output was noted and the patients were followed up at a regular interval of 3, 6 and 12 weeks to monitor for further complications and time needed to return to normal work noted.

Statistical Analysis

Data from each patient collected and tabulated using Microsoft excel.

All the statistical analysis was carried out by SPSS version 16. Microsoft word and excel have been used to generate graphs, table etc. Statistical method used was Z test, $p < 0.05$ considered statistically significant.

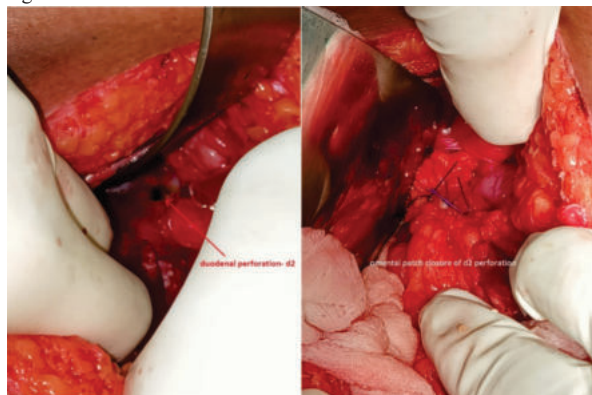


Figure 1: Duodenal Perforation In Open Repair With Omental Patch Closure

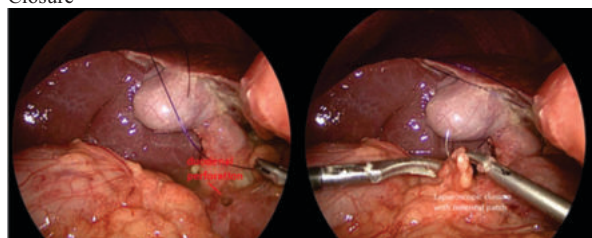


Figure 2: Laparoscopic Duodenal Perforation Closure With Omental Patch.results

In our study patients above the age of 18 were recruited with a maximum age of 70 years.

The mean age of the patients in the open group was found to be 35.9 ± 14.43 years, when compared to the mean age group in the laparoscopy group which was noted to be 47.4 ± 14.47 years which was found to be statistically significant.

In our study males accounted for 85% of the cases in the open group and 90% of the cases in the laparoscopy group. Male: female ratio in the open and laparoscopy groups was noted to be 5.6:1 and 9:1 respectively.

In the overall study males accounted for 87.5% of the cases with a male: female ratio of 7:1. However it was found to be statistically not significant.

The majority of the population in the open group presented to the hospital within 24 hrs of onset of presentation with a frequency of 10(50%), whereas, the majority of the population in the laparoscopy group also presented within 24 hrs but with a higher frequency 16 (80%).

The mean duration of symptoms before presentation to a hospital was noted to be 1.85 days and 1.25 days in the open and laparoscopic groups respectively which was noted to be statistically significant.

In the overall study, majority of the patients presented to the hospital within 24 hrs of onset of symptoms (65%).

The mean operative time in our study was noted as 60 ± 16.12 minutes and 143.8 ± 16.35 minutes respectively for the open group and the laparoscopy group which is statistically significant.

The difference in the operative time for the open procedure and the laparoscopic procedure may be attributed to the need for surgical expertise in the laparoscopic procedure and also the increased number of intraoperative steps in the laparoscopic procedure.

In our study, majority of the patients presented in the open group with a duodenal perforation of size 5 to 10 mm which accounted to 85% of the study group.

Meanwhile, in the laparoscopy group 50% of the patients presented with a perforation size of < 5 mm while the remaining 50% presented with a perforation size of 5 to 10 mm.

In our study the intraoperative collection was noted in both the open and laparoscopy groups and it was found to be mostly bilious in nature. Purulent collection was also noted in the cases with > 1 day of duration of symptoms. Due to the early presentation of most of the patients in our study population, the mean intraoperative collection was noted to be 391.25 ml.

The mean intraoperative collection noted in the open group and the laparoscopy group was 362.5 ± 97.16 ml and 420 ± 117.42 ml respectively. However, it was noted to be statistically not significant.

In our study, post operative pain was noted using VAS scoring where VAS score was noted in both the open and laparoscopic groups at 2 hrs postoperatively as 5 and 4.05 respectively which was statistically significant. This may be due to the presence of the general anesthesia which is still persistent at 2hrs postoperatively.

Both the groups were continued on iv tramadol as an analgesic and this showed a statistically significant difference in the VAS score at 6 hrs and 24 hrs in the open group (4.35,3.25) and in the laparoscopic group (2.35,1.25).

In our study post operative wound infection was noted only in 20% of the open repair group and 10% in the laparoscopic repair group.

Surgical site infections and burst abdomen were noted in the both the open group and laparoscopic group which increased the postoperative hospital stay for the patients in the study.

In our study the mean postoperative hospital stay was noted to be significantly lower in the laparoscopic group (7.25 days) compared to the open group (11.7 days) which was found to be statistically significant.

The mean time required to return to normal work was lower in the laparoscopic group (9.95 days) when compared to the open group (19.95 days) which was noted to be statistically significant.

It was noted that a majority of the patients in the open group returned to normal work in 16 to 20 days while the majority of patients in the laparoscopy group returned to normal work in less than 10 days. This may be due to the smaller size of incision in laparoscopic group when compared to the open group.

Table 1: Results Of Our Study

RESULTS	OPEN GROUP	LAPAROSCOPY GROUP	P VALUE
AGE	47.4 years	35.9 years	$P < 0.013$
MALE: FEMALE RATIO	5.6:1	9:1	$P = 0.5$
TIME OF PRESENTATION	1.85 days	1.25 days	$P < 0.053$
OPERATIVE TIME	60 mins	143.8 mins	$P < 0.053$
PERFORATION SIZE	5.2 ± 1.4 mm	3.7 ± 1.38 mm	$P < 0.002$
INTRAOPERATIVE COLLECTION	362.5 ± 97.16 ml	420 ± 117.42 ml	$P < 0.121$
POST OPERATIVE PAIN (MEAN VAS AT 2, 6, 24, 48 HRS)	5.00, 4.35, 3.25, 2.15	4.05, 2.35, 1.25, 1.10	$P < 0.001$
MORBIDITY	35%	20%	$P < 0.001$
POST OPERATIVE HOSPITAL STAY	11.7 days	7.25 days	$P < 0.04$
TIME TAKEN TO RETURN TO NORMAL WORK	19.95 days	9.95 days	$P < 0.001$

DISCUSSION

Duodenal perforation is known to occur in 5-10% of duodenal ulcer patients and account for over 70% of deaths associated with peptic

ulcer disease.

Minimal access surgery is steadily replacing the open surgical approach for a vast number of indications.

Recently laparoscopic approach to perforated peptic ulcer has gained wide acceptance over the traditional open repair on the basis of being an equally efficient and less invasive technique.

In our study the mean age of the patients in the open group was found to be 47.4 years, when compared to the mean age group in the laparoscopy group which was noted to be 35.9 years which is comparable to the study done by Amutha P et al in which the mean age of the open group was 41.86 and laparoscopy group was noted to be 43.5 years.

In our study the mean age of the patients in the open group was found to be 47.4 years, when compared to the mean age group in the laparoscopy group which was noted to be 35.9 years which is comparable to the study done by Amutha P et al in which the mean age of the open group was 41.86 and laparoscopy group was noted to be 43.5 years.

Male to female ratio in our study was 7:1. Thus, males clearly outnumbered the females. Similar observations were also reported in other studies.

Majority of the patients in this study (67%) presented to the hospital in less than 24 hrs from the time of appearance of the symptoms which showed similarities to the study done by Deshmukh S N et al., where 63.33% of the study population presented to the hospital within 12 hrs of onset of symptoms.

Due to the early presentation to the immediate response of the surgeons, the post operative complications were also reduced in number when compared to other studies.

Mean operative time in our study was 60 minutes for open and 143.8 minutes for laparoscopic repair respectively. This ratio is comparable with the study done in Amutha P et al, in which mean operative time for open group was 96 mins and 113 mins for the laparoscopy group.

Similarly in a study done by Deshmukh et al, the mean operative time for open group and laparoscopy group were noted to be 65.23 minutes and 111.6 minutes respectively.

In the majority of the patients noted in our study, duodenal perforation size was noted to be 5 to 10 mm (67.5%). Which is similar to the study done by Deshmukh S N et al. which showed 70% of the study population with <10 mm size perforation.

Pain assessment was done in our study at 2, 6, 24, 48 hours postoperatively using VAS scoring. In this assessment, average

postoperative pain score was noted to be similar in the open (5) and laparoscopic group (4.05) at 2 hrs but noted to be significantly lower in the laparoscopic group at 6 hrs which showed an average score of 4.35 and 2.35 in the open and laparoscopic group respectively. This may be due to provision of analgesics postoperatively for patients of both groups in our study.

This is comparable to the study done by Golash et al which showed a mean VAS score of 5.8 in the open group and 2.2 in the laparoscopy group on POD1.

In our study post operative wound infection was noted only in 20% of the open repair group and 10% in the laparoscopic repair group. This may be due to the small incision size in laparoscopic repair.

Overall, the morbidity in our study was 35% in the open group and 20% in the laparoscopy group with no deaths.

A similar study done by Suren et al, showed 44.5% of the open group and 10.7% of the laparoscopy group with complications and 18 deaths. The average post operative hospital stay in our study was noted to be higher in the open group (11.7) when compared to the laparoscopy group (7.25). this may be due to less bowel handling in laparoscopic repair and also the incision size which is much smaller in laparoscopic repair.

In a similar study done by Marietta et al the mean post operative hospital stay in the open group and laparoscopy group were noted to be 8 days and 6.5 days.

The average time required to return to normal work in open group was 19.95 days and lap group was 9.95 days which is comparable with 32.07 days in open group and 13.33 days in lap group in Deshmukh S N et al study.

The decreased number of days required to return to normal work in our study could be attributed to the higher frequency of student population of age less than 30 in the open repair group.

Table 2: Post Operative Pain Assessment In Various Studies

STUDY	MEAN VAS @ 24 HRS IN OPEN GROUP	MEAN VAS @ 48 HRS IN OPEN GROUP	MEAN VAS @ 24 HRS IN LAPAROSCOPY GROUP	MEAN VAS @ 48 HRS IN LAPAROSCOPY GROUP
GOLASH ET AL	5.8	4	2.2	2.4
MARIETTA ET AL	5.15	3	3.8	2.1
OUR STUDY	3.25	2.15	1.25	1.10

Table 3: Comparison Of Parameters With Various Studies

PARAMETERS	AGE		SEX		MEAN OPERATIVE TIME (mins)		MORBIDITY (%)		POST OPERATIVE HOSPITAL STAY (in days)		POST OPERATIVE RETURN TO WORK (in days)	
	OPEN	LAPAROSCOPY	OPEN	LAPAROSCOPY	OPEN	LAPAROSCOPY	OPEN	LAPAROSCOPY	OPEN	LAPAROSCOPY	OPEN	LAPAROSCOPY
ASHISH M ET AL	-	-	1.5:1	1.8:1	48	88	17%	7%	9.5	6.5	N/A	N/A
SUREN ET AL	51.9	40.3	5:1	2.7:1	94	128	44.5%	10.7%	9.8	5	N/A	N/A
KARIMIAN ET AL	44.44	46.19	2.8:1	2.8:1	47.4	55.74	22%	8%	6.52	4.67	N/A	N/A
MARIETTA ET AL	59	66	1.9:1	1.3:1	50	75	20%	10%	8	6.5	N/A	N/A
AMUTHA P ET AL	41.8	43.5	2.8:1	2.2:1	96	113.9	53.3%	0%	10.5	8.6	N/A	N/A
DESHMUKH ET AL	-	-	6.5:1	6.5:1	65.23	111.6	36.7%	20%	11	5.6	32.07	13.3
OUR STUDY	35.05	47.4	5.6:1	9:1	60	143.8	35%	20%	11.7	7.25	19.95	9.15

CONCLUSION

- A prospective comparative study of open vs laparoscopic duodenal ulcer perforation closure of 40 patients was done.

- It shows laparoscopic closure is safer and more feasible.
- The male patients were affected more with duodenal ulcer perforation in the age group 51 years to 60 years.

- Early presentation to the hospital makes the patient to undergo immediate laparoscopic procedure with reduced morbidity.
- Duodenal perforation of size ≤ 5 mm was more common and can be treated laparoscopically with good results.
- Even though laparoscopy takes more time initially however with experience it can be done as fast as open surgery.
- Wound infection is one of the commonest complications commonly seen in open surgery.
- Postoperative complications are very less and reduces the hospital stay in laparoscopy group and makes the patient to attend to his normal duties at the earliest when compared to open group.
- Hence, we conclude that laparoscopic closure of duodenal ulcer perforation is the gold standard treatment for duodenal ulcer perforation with less morbidity and mortality.

REFERENCES:

1. Motewar A, Tilak M, Patil D, Bhamare N, et al. Laparoscopic versus open management of duodenal perforation: a comparative study at a District General Hospital. *Prz Gastroenterol*. 2013;8(5):315-9
2. Santoshkumar N, Deshmukh, Hirav P, Parikh. Open versus laparoscopic repair of perforated duodenal ulcer: a comparative study. *International surgery journal*. 2020;7(4):7-4
3. Golash V. Ten-Year Retrospective Comparative Analysis of Laparoscopic Repair versus Open Closure of Perforated. *Oman Med J*. 2008 Oct;23(4):241-6.
4. Karimian F, Aminian A, Lebaschi AH, Mirsharifi R, Alibakhshi A. Perforated Peptic Ulcer, Comparison Between Laparoscopic and Open Repair. *Shiraz E-Medical Journal*. 2009 Feb 28;10(1):20-6.
5. P Amutha et al, Comparative study of Laparoscopic and open repair of duodenal perforation. *Journal of evidence-based medicine and health care*, volume 4 2017.
6. Bertleff MJ, Halm JA, Bemelman WA, van der Ham AC, van der Harst E, Oei HI, et al. Randomized clinical trial of laparoscopic versus open repair of the perforated peptic ulcer: the LAMA Trial. *World J Surg*. 2009 Jul;33(7):1368-73.
7. Stepanyan SA, Petrosyan AA, Safaryan HH, Yeghiazaryan HH, Aleksanyan AY, Hakobyan VM, et al. Laparoscopic and open repair for perforated duodenal ulcer: single-center experience. *Videosurgery and Other Miniinvasive Techniques*. 2019 Jan 1;14(1):60-9.