

Original Research Article

Open versus laparoscopic repair of perforated duodenal ulcer: a comparative study

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ABSTRACT

Background: Surgery is the mainstay of the treatment for perforated duodenal ulcer by closing the perforation with or without omental patch. There are no controversies in the surgical treatment of perforated duodenal ulcer but the best approach to surgery is still debatable. Advances in minimal access surgery has made it possible to close the perforated duodenal ulcer laparoscopically. The present study was conducted to compare the results of open and laparoscopic repair of perforated duodenal ulcer in terms of operative time, postoperative pain, hospital stay, and post-operative complications etc.

Methods: The study was conducted in Dr. V. M. Government Medical College and Hospital located in Solapur (Maharashtra) from December 2008 to December 2010. It was a prospective comparative study. Patients were randomly divided into 2 groups alternately where group A and B were operated by conventional and laparoscopic techniques respectively and their outcomes were compared.

Results: Most commonly affected age in this study was 51 to 60 years with male preponderance. Post-operative pain, analgesic requirement, wound infection, hospital stay, was significantly less in laparoscopic group as compared to open group ($p < 0.05$).

Conclusions: Laparoscopic repair of perforated duodenal ulcer is safe and feasible in properly selected patients and has superior results as compared to open surgery.

Keywords: Perforated duodenal ulcer, Laparoscopic repair, Open repair, Omental patch

INTRODUCTION

Perforated duodenal ulcer is mainly a disease of young men but because of increasing smoking in women and use of nonsteroidal anti-inflammatory drugs (NSAIDs) in all the age groups, nowadays it is common in the whole adult population.¹ With the invent of curative medical treatment for *Helicobacter pylori* the incidence of peptic ulcer disease and related complications have been decreased considerably and the definitive surgical procedures are rarely performed now a days. But surprisingly the incidence of perforation has not decreased which indicate that there are possibly more

than one factors involved in the etiology of perforated peptic ulcer disease. The *Helicobacter pylori* infection, smoking, fasting during Ramadan, use of non-steroidal anti-inflammatory drugs and past history of peptic ulcer are all the reported statistically significant contributing factors for perforation.²⁻⁵

Surgery is the mainstay of the treatment for perforated duodenal ulcer by closing the perforation with or without omental patch. There are no controversies in the surgical treatment of perforated duodenal ulcer but the best approach to surgery is still debatable. The present study was conducted to determine the feasibility of

laparoscopic repair of duodenal perforation and to compare it with the conventional open repair in terms of operative time, postoperative pain, hospital stay, and post-operative complications in our set-up.

METHODS

After obtaining the institutional ethics committee approval, present prospective descriptive study was carried out in the department of surgery at Dr. V. M. Government Medical College and Hospital located in Solapur (Maharashtra) from December 2008 to December 2011.

Inclusion criteria

All the patients, regardless of age and sex with diagnosis of perforated duodenal ulcer.

Exclusion criteria

Patients with sealed perforation. Radiologically there is evidence of gas under diaphragm but clinically without signs of peritonitis. Patients with shock with systolic blood pressure (<90 mm Hg) and not responding to intravenous fluids and vasopressor drugs. Patients having perforation other than duodenal ulcer perforation.

Patients included in the study as per the inclusion criteria mentioned above were subjected to routine haematological and radiological investigations and divided into open and laparoscopic group. Eligible patients were assigned to open and laparoscopic surgery by lottery method. Consent for conversion to open, if required, was taken in laparoscopic group before surgery. Closure of the duodenal perforation carried out with omental patch in both groups under general anaesthesia. 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). Intraoperative blood loss measured by dry gauze method. Thorough peritoneal lavage was given in all cases. All patients were discharged with *H. pylori* eradication therapy and long-term proton pump therapy.

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.

RESULTS

During the study period, consecutive 60 patients of duodenal perforation admitted and treated surgically were included. The most vulnerable age group in this study was 51 to 60 years (25%). Out of 60 cases studied, 52 were male and 8 were females. Thus, males clearly outnumbered the females. In majority of patients (70%) size of perforation was equal to or less than 10 mm. In our study 63.33% of patients presented within 12 hours after onset of symptoms. Only one patient presented 72 hours after onset of symptoms.

Table 1: Age distribution.

Age group (years)	Total cases (%)
11-20	6 (10)
21-30	10 (16.67)
31-40	13 (21.66)
41-50	7 (11.67)
51-60	15 (25)
61-70	3 (5)
>70	6 (10)

Table 2: Sex incidence.

Sex	Total cases (%)
Males	52 (86.67)
Females	08 (13.33)

Table 3: Distribution according to size of duodenal perforation.

Size of duodenal perforation (in mm)	Total cases (%)
<5	0 (0)
5 to 10	42 (70)
10 to 15	16 (26.67)
15 to 20	2 (3.3)
>20	0 (0)

Table 4: Time of presentation to hospital from the onset of symptoms.

Time of presentation to hospital from the onset of symptoms (hours)	Total cases (%)
<12	38 (63.33)
12-24	14 (23.33)
24-36	3 (5)
36-48	2 (3.33)
48-60	1 (1.67)
60-72	1 (1.67)
>72	1 (1.67)
Total	60 (100)

The average operative time in open group was 65.23 minutes while average operative time in laparoscopic group was 111.6 minutes which is statistically significant.

Intraoperative blood loss is measured by dry gauze method. The average intra-operative blood loss in open group was 122.33ml while average intra-operative blood loss in laparoscopic group was 41ml which is statistically significant.

The average perioperative analgesic requirement in open group was 4.1 days while average perioperative analgesic requirement in laparoscopic group was 2.47 days which is statistically significant.

The average post-operative hospital stay in open group was 11 days while in laparoscopic group was 5.6 days which is statistically significant.

Table 5: Operative time.

Operative time (minutes)	Open group	Laparoscopic group
	No. of patients (%)	No. of patients (%)
<40	0 (0)	0 (0)
41-60	13 (43.33)	0 (0)
61-80	16 (53.34)	0 (0)
81-100	1 (3.33)	3 (10)
101-120	0 (0)	24 (80)
121-140	0 (0)	3 (10)
141-160	0 (0)	0 (05)
>160	0 (0)	0 (0)
Total	30 (100)	30 (100)

Table 6: Intraoperative blood loss.

Intraoperative blood loss (ml)	Open group	Laparoscopic group
	No. of patients (%)	No. of patients (%)
30-50	0 (0)	30 (100)
50-70	0 (0)	0 (0)
70-90	0 (0)	0 (0)
90-110	3 (10)	0 (0)
110-130	23 (76.67)	0 (0)
130-150	4 (13.33)	0 (0)
>150	0 (0)	0 (0)

Table 7: Perioperative analgesic requirement.

Maximum duration of peri-operative analgesic requirement (POD-post operative day)	Open group	Laparoscopic group
	No. of patients (%)	No. of patients (%)
POD 1-2	0 (0)	17 (56.67)
POD 3-4	24 (80)	12 (40)
POD 5-6	4 (13.33)	0 (0)
POD 6	2 (6.67)	1 (3.33)

Table 8: Postoperative hospital stay.

Post-operative hospital stays (days)	Open group	Laparoscopic group
	No. of patients (%)	No. of patients (%)
<3	0 (0)	0 (0)
3-5	0 (0)	22 (73.33)
6-8	0 (0)	7 (23.33)
9-11	24 (80)	0 (0)
12-14	4 (13.34)	0 (0)
15-17	1 (3.33)	1 (3.33)
>17	1 (3.33)	0 (0)

Table 9: Postoperative complications.

Postoperative complications	Open group	Laparoscopic group
	No. of patients (%)	No. of patients (%)
Wound infection	5 (16.67)	1 (3.33)
Leak	0 (0)	1 (3.33)
Burst abdomen	2 (6.67)	1 (3.33)
Prolonged paralytic ileus	3 (10)	1 (6.67)
Pulmonary complications	1 (3.33)	0 (0)
Intraabdominal abscess	0 (0)	2 (6.67)
Death	2 (6.67)	0 (0)

Table 10: Time required to return normal work.

Time required to return normal work (in days)	Open group	Laparoscopic group
	No. of patients (%)	No. of patients (%)
POD 10-15	0 (0)	29 (96.67)
POD 15-20	0 (0)	0 (0)
POD 20-25	0 (0)	0 (0)
POD 25-30	16 (53.33)	1 (3.33)
POD 30-35	12 (40.00)	0 (0)
POD 35-40	2 (6.67)	0 (0)
POD >40	0 (0)	0 (0)

Postoperative wound infection rate is more in open group (16.67%) than in laparoscopic group (3.33%). Incidence of intra-abdominal abscess is more in laparoscopic group. Post-operative leak was noticed in one patient in laparoscopic group which was managed by exploratory laparotomy and re-suturing. 2 patients from open group died during treatment.

The average time required to return to normal work in open group was 32.07 days while in laparoscopic group was 13.33 days which is statistically significant ($p < 0.05$).

DISCUSSION

Perforation is common and life-threatening complication of peptic ulcer disease that 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. During the last decade 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.

The most vulnerable age group in this study was 51 to 60 years (23.33%). Similar observations were also reported in the study conducted by Critchley et al.⁶ In the study conducted by Karydakos et al., the mean age of the patient was 46 years.⁷ Male to female ratio in our study was 1:0.1. Thus, males clearly outnumbered the females. Similar observations were also reported in other studies.⁸ Mean operative time in our study was 62.83 minute for open and 100.13 minutes for laparoscopic repair

respectively which is comparable with 63 min. for open and 106 min. for laparoscopy in Katkhouda et al, study.⁹ Operative time depends on the surgeon's experience in laparoscopy.

In our study, perioperative analgesic requirement in open group was 4.1 days and laparoscopic group was 2.60 days which is comparable with 3 days for open and 1 day for laparoscopic group in Katkhouda et al study. Post-operative hospital stay in open and laparoscopic group was 9.85 days and 5.6 days respectively. This figure is comparable with 9 days for open and 4 days for laparoscopic repair in Golash et al.^{10,11}

In our study, postoperative wound infection rate was more in open group (16.67%) than in laparoscopic group (3.33%). Wound infection rate is less in laparoscopic group this may be due to small laparoscopic incisions. Similar findings were also recorded in a study conducted by Lunevicius et al.¹²

The average time required to return to normal work in open group was 32.07 days and lap group was 13.33 days which is comparable with 31 days in open group and 12 days in lap group in Golash et al study. Time required to return to normal work was more in open group than its laparoscopic counterpart. Similar findings were also noted in Mehendale et al study.¹³ Time required to return to normal diet in open group was 4.23 days and laparoscopic group was 3.06 which is comparable with 5 days for open 3 days for laparoscopic repair in Katkhouda et al study. Time required to return to normal diet in laparoscopic group is shorter due to less bowel

handling and less chance of post-operative ileus in laparoscopic group.

CONCLUSION

Laparoscopic treatment of perforated peptic ulcer is technically feasible and safe when performed by experienced surgeon in properly selected patients. Statistically significant findings in favour of laparoscopic repair in our study were less post-operative pain, analgesic requirement, faster recovery, reduced hospital stay, less wound infection rate.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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