

ORIGINAL ARTICLE**Laparoscopic vs Open Surgery for the Management of Duodenal Ulcer Perforation: A Comparative Study**Monika Gupta¹, Alok Chhabra²¹Assistant Professor, Department of Surgical Gastroenterology, National Institute of Medical Sciences & Research, Jaipur, Rajasthan, India;²Assistant Professor, Department of General Surgery, National Institute of Medical Sciences & Research, Jaipur, Rajasthan, India**ABSTRACT:**

Introduction: This study was taken up to compare the laparoscopic and open repairs for the management of perforated duodenal ulcer and to assess the safety and feasibility of laparoscopic route in our set-up. **Materials and Methods:** The main surgical treatment is simple repair of the perforation site. This can be performed as a primary closure with or without the addition of an omental patch. The open surgery was conducted by midline incision and followed the same technical guidelines. All the data expressed as median and in quartile range unless stated. Comparison between two groups was made using nonparametrical methods. Comparison was done using independent samples t-test, $p < 0.05$ taken as statistically significant. **Results:** The features included patient profile, intra-operative time, postoperative complications, pain scores (VAS), time to resume orals and hospital stay. Follow up was done for minimum one month. The mean age in open repair group was 42.58 years and in laparoscopic repair was 36.31 years. This was statistically significant. **Conclusion:** Laparoscopic repair of perforated peptic ulcer is a safe and reliable procedure and is proven to be efficient.

Keywords: Laparoscopic, Open Surgery, Duodenal Ulcer Perforation

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INTRODUCTION

The pathophysiological insult of a 'tension CO₂ pneumoperitoneum' during laparoscopy may be exaggerated in such patients, while the effect on the immune system and its mediators is unpredictable. The balance of exchanging the obvious postoperative benefits of rapid recovery,¹⁻³ reduced wound complications, improved respiratory function and improved cosmetic appearance for an increase in intraoperative physiological compromise may be in favor of laparoscopic surgery in relatively fit elective patients, but may be considerably more marginal in ill patients at risk of multiple organ dysfunction syndrome (MODS).⁴ To examine the risks and benefits of laparoscopic surgery for perforated peptic ulcers, this nonrandomized cohort comparison compared a consecutive series of laparoscopic repairs of perforated peptic ulcers (lap group)⁵⁻⁷ with a concurrent series of consecutive open repairs (open group).

The two major causes of peptic ulceration and perforation are H. pylori infection and NSAIDs. In patients with recurrent ulcers despite active treatment, hypersecretory states such as Zollinger-Ellison syndrome need to be considered. The incidence of peptic ulcer disease (PUD) has been decreasing globally due to eradication of Helicobacter pylori and use of proton pump inhibitors (PPIs).⁸ In despite of this, the incidence of perforated PUD has increased

because of the wider use of nonsteroidal antiinflammatory drugs (NSAIDs).⁹ Emergency surgery usually is essential in PUD complications. Laparotomy has long been the standard treatment of perforated peptic ulcers (PPU).⁸ After the first description of the procedure by Mouret et al. and Nathanson et al. in the nineties, a number of studies have demonstrated that laparoscopic repair is feasible and safe and even better than the open approach.¹⁰⁻¹⁴ Laparoscopic repair is indeed a very useful method of dealing with this common complication of peptic ulcer disease, which forms a large bulk of patients presenting to surgery emergency with acute abdomen. Laparoscopic approach overcomes the disadvantages of a conventional open repair which includes large upper abdominal incision, wound infection and dehiscence, prolonged ileus and pulmonary complications, delayed recovery times and late complications like incisional hernia. Laparoscopic repair confers all the advantages of minimal access surgery for this life-threatening condition and is desirable in properly selected patients. Many studies support this modality of management.¹⁵⁻¹⁷ Our tertiary care hospital caters to the most remote areas of the state. Due to lack of resources and expertise, a huge segment of the population is not offered laparoscopic choice. This study was taken up to compare the laparoscopic and open repairs for the management of

perforated duodenal ulcer and to assess the safety and feasibility of laparoscopic route in our set-up.

MATERIALS AND METHODS

This study was conducted in Department of General Surgery, National Institute of Medical Sciences & Research, Jaipur. Informed consent for randomization to laparoscopic or open omental patch repair was obtained from all patients. A total of 95 patients were included in the study with 45 in lap group and 46 in open group.¹⁸⁻²¹ Patients with a surgical diagnosis other than perforated peptic ulcer and previous abdominal surgery were excluded at surgery. Following parameters were noticed: operative duration, analgesics and antibiotics requirement (pre- and postoperative), postoperative hospital stay,²² local and systemic complications. All the cases underwent preoperative assessment, the decision to operate laparoscopic or open surgery depending on the patient presentation.²³ Their preoperative and intraoperative, postoperative findings and complications were meticulously recorded as per protocol.²⁴

The main surgical treatment is simple repair of the perforation site. This can be performed as a primary closure with or without the addition of an omental patch. Alternatively, a pedicled omental flap (Cellan-

Jones repair) or free omental plug (Graham patch) can be sutured into the perforation. Sutureless techniques have also been developed using a gelatin sponge and fibrin glue to seal off the perforation. There seem to be no significant differences in terms of postoperative morbidity and mortality rates when comparing primary closure, omentopexy or tegmentation (without closure). Surgical repair can be performed either with conventional open surgery or with laparoscopy.

The open surgery was conducted by midline incision and followed the same technical guidelines. All the data expressed as median and in quartile range unless stated. Comparison between two groups was made using nonparametrical methods. Comparison was done using independent samples t-test, $p < 0.05$ taken as statistically significant.

INCLUSION CRITERIA

All patients admitted in NCMC with non traumatic duodenal ulcer perforation.

EXCLUSION CRITERIA

Patients with traumatic duodenal perforation and all moribund patients with duodenal ulcer perforation.

RESULTS

The features included patient profile, intra-operative time, postoperative complications, pain scores (VAS), time to resume orals and hospital stay. Follow up was done for minimum one month. The mean age in open repair group was 42.58 years and in laparoscopic repair was 36.31 years. This was statistically significant (Table 1).

Table 1: Age distribution

Statistical derivation	Open procedure (N = 59)	Lap procedure (N = 36)	Unpaired student t-test value	P Value
Mean	42.58	36.31	3.691	<0.05
SD	11.10	10.951		

In the laparoscopic repair group 74.5% patients were males and in the open repair group 77.7% were males. Thus, both groups had predominance of male patients. In the open repair group 75% patients had history of smoking similar to laparoscopic group with 66.2%. The history of peptic ulcer disease was present in 25.4% patients in open group and 27.7% in laparoscopic group. In open repair 47.4% had history of NSAID use compared to 27.3% observed in the laparoscopic repair group which was statistically significant (Table 2).

Table 2: Patient profile

Profile feature		Open N (%) 59 (62.1)	Lap N (%) 36 (37.8)	Statistical derivation
Sex	Male	44 (74.5)	28 (77.7)	$\chi^2 = 1.638$
	Female	15 (25.4)	08 (22.2)	df = 1, P = 0.2005
H/O Peptic ulcer ds	Yes	14 (23.7)	10 (27.7)	$\chi^2 = 0.488$
	No	45 (76.2)	26 (72.2)	df = 1, P = 0.4851
Smoking	Yes	33 (55.9)	24 (66.6)	$\chi^2 = 0.015$
	No	19 (32.2)	12 (33.3)	df = 1, P = 0.9173
NSAIDS	Yes	28 (47.4)	10 (27.3)	$\chi^2 = 6.828^*$
	No	31 (52.5)	26 (72.2)	df = 1, P = 0.0093

One patient in our study was converted from laparoscopic to open group leading to a conversion of 5.51%. The mean intraoperative time in open repair was 57.81 minutes and laparoscopic repair was 92.17 minutes. The difference was statistically significant. The laparoscopic repair took significantly longer operative time (Table 3).

Table 3: Intra/post op factors

Factor	St. derivation	Open N (%) 59	Lap N (%) 36	Unpaired t test value	P Value
Operative time (mins)	Mean	57.81	92.17	23.41	<0.001
	SD	8.21	5.711		
Day 2 VAS*	Mean	7.82	3.81	13.10	<0.05
	SD	0.78	0.515		
Time to resume oral feeding (days)	Mean	5.31	3.61	38.70	<0.05
	SD	0.915	0.481		
Hospital stay (days)	Mean	9.52	6.13	195.81	<0.001
	SD	0.84	0.304		

Pain scores were significantly reduced at one month follow up in laparoscopic group with all patients reporting no pain. 20.5% patients with open repair had pain at one month post-operative period (Table 4).

Table 4: Follow-up.

Feature	Open	Lap	P value
Wound pain	13	0	0.028
Incisional hernia	0	0	
Complications due to adhesions	0	0	

DISCUSSION

The mean operating time of the laparoscopic patch repair was significantly longer than the open procedure (52.4:62.1 minutes; $p = 0.001$) which correspond to other studies. A disadvantage of the laparoscopic approach is longer operating time, but this had no impact on the outcome. Three (9.6%) patients were needed conversion to open surgery due large perforation (>1 cm) and other 2 patients had dense adhesions. In analyzing our results with other studies, we observed that clinical parameters that are excluded for safe laparoscopic procedure are shock and symptom duration >24 hours. Patients who presented with shock and delayed presentation have higher conversion rate and worse postoperative course. The best parameters to compare the two different surgical techniques are morbidity and mortality. Peptic ulcer perforation has high morbidity with problems of wound infection, sepsis, leakage at repair and pulmonary infections. In our study, high morbidity three (9%) and mortality two (6%) was noticed in open group which is consistent with other studies.^{25,26} The analgesic requirement was significantly less in lap group ($p = 0.002$); the time to return to normal diet is shorter in lap group (3 days, $p = 0.001$). This was significantly reflected on the duration of hospital stay which was shorter with lap group (3 days, $p = 0.003$). A follow-up of upper GI endoscopy was performed on 5 in lap group and 7 in open group after 6 months, rest of patients did not turn up for follow-up. No recurrence of ulcer was noticed in both groups.

The mean age in laparoscopic group was significantly lower than open repair group. This may have contributed to better patient recovery in the laparoscopic group. But, since the mean age in open repair was 41.61 years which is significantly lower than 54 years reported in a large meta-analysis by Antoniou et al⁸ and patients with comorbidities were excluded from our study, age alone may not be the only factor responsible for the better outcome in laparoscopic group. The majority of patients in our study in both the groups were males. Similar male dominance in such patients were reported by Bertleff et al.²⁷ Association with predisposing factors of peptic ulcer disease esp. smoking and NSAID use was observed in our study. Vaidya et al in their study also reported similar findings.²⁸ We adopted four ports positioning in laparoscopic repair but, in 3 patients we put three ports. Successful repair with three ports has been described by Lo et al.²⁹ Abdalaziem et al also reported similar technique with omission of the liver retraction port.³⁰ There are many causes of conversion of laparoscopic to open route. We had one patient who had to be converted to open route due to inadequate omental patch mobilization. Variable conversion rates have been quoted in literature ranging from as low as 0% by Palanivelu et al to up to 14.2% by Siu et al.^{31,32}

Our study results are comparable with other studies as depicted in the tables, since most of the patients present after 24hrs of onset of symptoms, lack of modern anaesthetic instruments and presence of co morbidities limits the treating doctors to take up the laparoscopic technique as the choice of procedure in

our hospital. Laparoscopic closure of duodenal perforation closure is encouraging, in patients who presents within 24hrs of onset of symptoms, relatively younger patients, without any co morbid conditions and if the surgeon is expertise in laparoscopic surgeries.

CONCLUSION

Laparoscopic repair of perforated peptic ulcer is a safe and reliable procedure and is proven to be efficient. Even though it was associated with longer operating time, it had no impact on outcome. It had less postoperative pain, reduced chest complications and reduced analgesic usage, shorter postoperative hospital stay, and earlier return to normal daily activities than the conventional open repair. It has lesser morbidity and mortality as compared to open group. Data from the present study indicate that laparoscopic surgical treatment of patients with peptic ulcer perforation can be implemented and completed safely in a large proportion of patients with this life-threatening condition, given that the responsible surgical team has the appropriate technical expertise. We need to do study with more number of cases as to claim advantage of laparoscopic surgery.

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