

# Laparoscopic Repair of Peptic Ulcer Perforation - Single Centre Experience

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## ABSTRACT

**Introduction:** Laparotomy with peritoneal lavage and perforation repair is the standard management of perforated peptic ulcer. But the open surgery is associated with increased morbidity and delay in returning to routine activities. Laparoscopic procedures are associated with less pain post-operatively with early return to daily activities.

**Aim:** To assess the feasibility of laparoscopy in the management of peptic ulcer perforation at our centre.

**Materials and Methods:** It was an observational study, conducted from June 2009 to November 2011. Patients with peptic ulcer perforation aged 18-50 years, presenting within 72 hours of initiation of symptoms were included.

Feasibility of laparoscopic repair was evaluated in terms of intra-op difficulties during repair, operative duration, post-op recovery and complications. Descriptive statistic was used.

**Results:** All 42 patients were male with mean age of 29.3 years. Seventy six percent patients presented within 48 hours. Mean duration for repair was 69.34 minutes. Ryle's tube was kept for mean duration of 2.14 days. Mean duration for drain removal was 4.24 days and for hospital stay, it was 5.52 days.

**Conclusion:** It is feasible to use laparoscopy for repair of perforation in earlier presenting patients.

**Keywords:** Lloyd-Davis position, Port placement, Stomach retraction

## INTRODUCTION

Peptic ulcer is the leading cause of perforation peritonitis and surgery-related death worldwide [1]. Despite the surgical and medical advances, the incidence of perforations has remained stable [2]. Mortality associated with perforation is approximately 10–20 % [3-7]. Use of effective acid suppressing drugs has decreased the complications and need for definitive surgical treatment of peptic ulcer disease.

Laparotomy with peritoneal lavage and simple repair with Cellan-Jones method is in practice since long time. But the open surgery is associated with increased morbidity and delay in returning to routine activities. First time, laparoscopic repair of duodenal ulcer perforation was done by Mouret et al., using suture-less fibrin glue omental patch. First successful laparoscopic suture repair was described by Nathanson [8].

Laparoscopic repair has faster recovery and better cosmetic outcome. The disadvantages of laparoscopy are increased duration of operation, risk of hypercarbia and toxemia due to pneumo-peritoneum [9]. There is also associated learning curve. Present study is done to evaluate the feasibility of laparoscopic perforation repair in our centre in terms of

intra-op difficulties, operative duration, post-op recovery and complications.

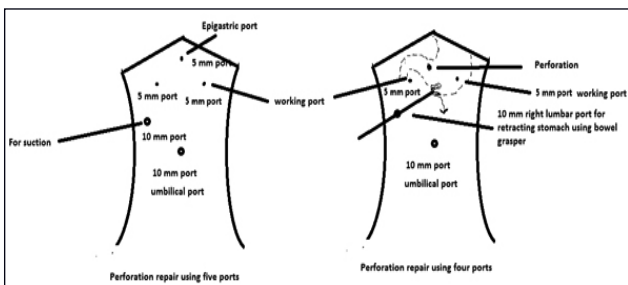
## MATERIALS AND METHODS

This was an observational study conducted from June 2009 to November 2011 in our tertiary health care centre. Study was approved by Institutional Ethics Committee. Patients aged 18-50 years, presenting within 72 hours of initiation of symptomatology (pain in abdomen) with clinical features (presence of tenderness, guarding/ rigidity all over abdomen, along with absent liver dullness) and radiological features (free air under diaphragm) suggestive of hollow viscus perforation were included. Patients with co-morbid diseases like chronic obstructive pulmonary disease, ischemic heart disease, who were unfit for emergency laparoscopic surgery and with prior history of abdominal surgery, were excluded. Total 42 patients were selected. Informed consent was taken from all patients. Descriptive statistical analysis was used.

Routine investigations were performed. Patients with their blood urea nitrogen either greater than 20 mg/dl or serum creatinine greater than 1.5 mg/dl or both were considered to have deranged renal function. During resuscitation with

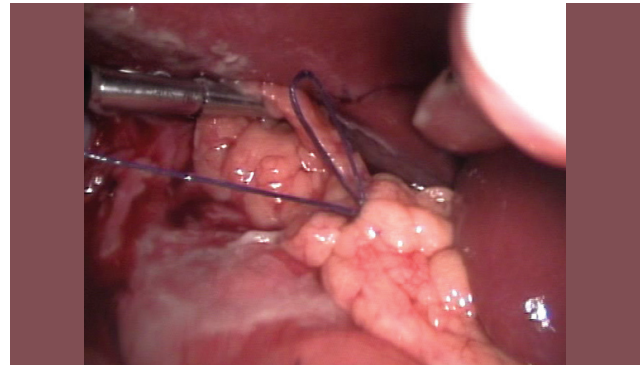
intravenous fluids, antibiotics were given. Naso-gastric tube and catheter were inserted, and urine output was measured. After normalization of blood pressure (mean arterial blood pressure >70 mmHg) without any vaso-pressor support, patients were shifted to operation theatre for induction.

Patients were put in either supine position with operating surgeon on left side or in Lloyd-Davis position with reverse Trendelenberg tilt and operating surgeon standing in between the legs. Pneumo-peritoneum was created either by open method or by Veress needle. Repair was done using either five or four ports. In four ports repair, epigastric port was excluded and right lumbar port was used for both suction and for retracting stomach into operation field. This fourth port was used for bringing stomach into operation field by traction over greater curvature using atraumatic bowel grasper, without retraction of liver. Ports were placed as shown in [Table/Fig-1].



[Table/Fig-1]: Showing port placement using five and four ports.

Diagnostic laparoscopy was done with pressure maintained between 11-13 mmHg. Collected fluid was aspirated from each quadrant, starting from right sub-hepatic. Site of perforation was identified. Sometimes identification required dissection of filmy adhesions between liver and stomach. Size of perforation was measured using either suction tip or by open jaw of Maryland forceps. Perforation was repaired depending on the size of perforation by either simple intermittent stitches or by Cellan-Jones method. Perforation with size < 5mm was repaired with single stitch, whereas those with size > 5mm were repaired using intermittent stitches with Cellan-Jones method using poly-glycine no. 2-0 suture with round body needle. Number of stitches taken was decided by the size of perforation, perforations measuring approximately 10mm were repaired using 2 intermittent stitches whereas those with size > 10mm were repaired with 3 stitches. In Cellan-Jones method, sutures were taken from ulcer edges, and omentum was brought over the perforation. Knots were tied over the omentum. Stitches were applied longitudinally across the perforations with a good bite of full-thickness healthy tissue. The ulcer edges were approximated by intracorporeal knotting, with two identical half knots forming a square knot followed by a third and opposite half knot [Table/Fig-2]. After



[Table/Fig-2]: Showing repair of perforation by Cellan-Jones method.

repair, thorough irrigation and suction of abdominal cavity was done till fluid become clear.

If gross intra-abdominal collection with purulent discharge was found intra-operatively, drain was kept. Drain kept in right sub-hepatic space was brought out through right lumbar port. Any intra-operative complications (e.g. trauma to other organ) or difficulty with suturing due to port placement during perforation repair were noted. Time taken for procedure- from insertion of first port to suturing of port sites- was recorded.

Patients were observed for post-operative complications, e.g. pneumonia, urinary tract infection, port site infection, intra-abdominal collection, prolonged ileus, leak, etc.

Bowel sound appearance after 5<sup>th</sup> post-operative day, was labeled as prolonged ileus [10].

Antibiotics were continued for 7 days. Intravenous antibiotics were given till subsidence of fever and normalization of WBC counts, followed by replacement with oral antibiotics. Intravenous fluids and naso-gastric tube aspiration for every 6 hour were continued till the appearance of bowel sound and passage of flatus by patient. Drain was removed 24 hours after initiation of oral diet and with drain output less than 50 ml/24 hours.

## RESULTS

In this study, 42 patients of peptic ulcer perforation were repaired by laparoscopy. All were men patients with mean age of presentation  $29.3 \pm 7.45$  years ( $n \pm SD$ ). Seventy six percent (32/42) patients presented within 48 hours whereas remaining (10/42) presented between 48-72 hours. On presentation, 24% (10/42) were in shock (Mean BP < 70 mmHg with tachycardia), they were resuscitated. Raised total leucocytes ( $> 11,000/mm^3$ ) counts were present in 95% patients (40/42). Kidney function was deranged in 24% patients (10/42) on evaluation serum electrolytes were found to be deranged in 17% patients (7/42). These were corrected.

Pneumo-peritoneum was created by open method in 55% patients (23/42) whereas in 45% patients (19/42), it was created using Veress needle. In initial 24% procedures (10/42),

operating surgeon performed whole procedure while standing on left side of patient with patient in supine position, whereas remaining, i.e., 76% procedures (32/42) were completed with position of operating surgeon in between the legs of patient with patient in Lloyd- Davis position with reverse Trendelenberg tilt. During our initial two cases, five ports were required for the procedure. In later all cases, four ports were used.

Perforation was in the first part of duodenum in 64% patients (27/42) and in remaining, perforation was in pyloric region. In 43% patients (18/42) size of perforation was less than or equal to 5 mm, in 36% patients (15/42) it was 6mm to 10mm and size was 11mm to 15mm in 21% (9/42). Only single stitch without Cellan-Jones repair was adequate in 43% (18/42) patients due to their small size of perforation, i.e.  $\leq 5$ mm; two and three stitches with Cellan-Jones repair were sufficient in 28.5% (12/42) patients each for closure of larger defect. Drain was kept in 83% (35/42) patients.

Mean duration for repair of peptic ulcer perforation was  $69.34 \pm 19.46$  minutes (n  $\pm$ SD) with the range of 50 to 120 minutes. Naso-gastric tube was removed at mean duration of  $2.14 \pm 0.89$  days (n  $\pm$  SD). Oral liquid diet was started after mean duration  $3.19 \pm 1.01$  days (n  $\pm$  SD). Mean duration of removal of drain was  $4.24 \pm 1.23$  days (n  $\pm$  SD) [Table/Fig-3].

Intra-op trauma to liver occurred in second patient due to retractor while using fifth epigastric port which resulted in brisk hemorrhage. Conversion to open was done and bleeding was controlled in this case. Details of the post-op complications are given in [Table/Fig-4].

Post-operative Period	Ryle's Tube Removed	Oral Diet Started	Drain Removed	Hospital Stay
Day 1	26% (11/42)	-	-	-
Day 2	40% (17/42)	26% (11/42)	-	-
Day 3	26% (11/42)	40% (17/42)	24% (10/42)	-
Day 4	7% (3/42)	26% (11/42)	40% (17/42)	21.5% (9/42)
Day 5	-	2% (1/42)	12% (5/42)	38% (16/42)
Day 6	-	5% (2/42)	5% (2/42)	21.5% (9/42)
Day 7	-	-	2% (1/42)	7% (3/42)
Day 8	-	-	-	9.5% (4/42)
Day 9	-	-	-	2% (1/42)

**[Table/Fig-3]:** Post-operative course of recovery following laparoscopic repair of perforation (n=42).

Complications	No. of Patients	Percentage
Port site infection	05	12%
Prolonged ileus	01	2.4%
Pneumonia	01	2.4%
Abdominal collection	03	7.14%
Urinary tract infection	01	2.4%

**[Table/Fig-4]:** Post-operative complications following laparoscopic repair of perforation.

Mean duration of hospital stay was  $5.52 \pm 1.31$  days (n  $\pm$ SD).

## DISCUSSION

In this study, initially we used epigastric port for liver retraction and separation of adhesions in between liver and stomach in right sub-hepatic space. But in second case, trauma occurred to liver by the fan retractor which required conversion to open. So, in all our later cases we adopted this new method of using right lumbar port for retraction of stomach into operation field for repair of peptic ulcer perforation. Rather than use of epigastric port for retraction of edematous, friable liver, use of port in right lumbar region with atraumatic bowel grasper for traction over stomach was more easy and avoided trauma to liver. In later cases, trauma to liver was not seen in any patient. There are reports of liver injury during laparoscopy procedures by retractor which may lead to bleeding [11,12].

Initial time required was longer because of our learning experience, but in later cases we finished procedure earlier, with minimum duration of 50 minutes. Duration required in our study was comparable to the duration required in the study by Guglielminoti et al., [13] and Robertson et al., [14], where as the operative duration was less in our study than that of duration in Matsuda et al., [15] and Lau et al., [16] study.

After the initial reports of laparoscopic treatment of perforated peptic ulcer [8], different methods of perforation repair had been attempted including repair by gelatin sponge and fibrin glue [16,17], stapled omental patch repair [18,19] and gastroscopy-aided insertion of the ligamentum teres hepatis [20]. Pescatore et al., have used the gastroscopic-guided omental plug to close the perforation [21] and others have used U-clip method to close the perforation [13]. In our study of laparoscopic perforation repair, we adopted the suture closure method and Cellan-Jones method for repair because it is based on the principle of conventional open repair and does not require additional foreign bodies.

Mean duration of naso-gastric tube removal in our study was comparable to the duration in the study by Siu et al., [22] and Matsuda et al., [15]. Duration to start oral diet was similar to the duration for initiation of oral diet in the studies performed by Lau et al., [16] and Guglielminoti et al., [13].

Hospital stay was 5-7 days in the studies by Robertson et al., [14], Guglielminoti et al., [13] and Bergamaschi et al., [23]. It was comparable to the mean duration of hospital stay in our study. Further the mean hospital stay was less than the hospital stay in studies by Michelet et al., [24] and Matsuda et al., [15].

Association between late presentation and adverse outcome has been shown initially [25]. We found that the incidence of shock, septicemia increases with increased duration of presentation, as 60% of the patients presenting with shock, presented in 48-72 hours, and 30% in 24-48 hours in this

study. Similar was the finding with deranged renal function with delayed duration of presentation. Friable tissues and intra-abdominal loculated collection- associated with the delayed presentation, made perforation repair difficult and further caused difficulty in complete suctioning of collection and intra-abdominal wash. But post-operative improvement following laparoscopic repair was rapid with early return to routine activities. This may also be due to less access trauma, with better suctioning of all loculated fluid collection and thorough wash given till the effluent become clear [20,22,26]. No conversion to open was done in delayed presenting patients as compared to initial studies [26,27]. No case was converted to open considering size of perforation. Conversion was done for hemorrhage due to trauma to liver where as other studies mention conversion to open considering size of perforation [16,26,28].

Incidence of post-operative complications was similar to those in other studies, except the less incidence of pneumonia in our study. Leak was not seen in any patient. There were no re-exploration and mortality. Laparoscopic surgery minimizes postoperative wound pain and encourages early mobilization and return to normal daily activities [26, 28, 29] [Table/Fig-5].

Considering the benefits such as early discharge and early return to work, associated with the laparoscopic procedures, it may outweigh the consumable cost required in the performance of the laparoscopic procedures [28].

Though, it is better to repair perforated peptic ulcer laparoscopically, it was associated with the longer operative duration in initial cases. Further, increased duration of presentation makes collection loculated, with sometimes associated adhesions and friable tissues- which may lead to bleeding while separating adhesions. Aspiration of whole collection becomes difficult with increased post-operative complications.

We noticed that, repair of perforation with surgeon in between the legs of patient, with patient in Lloyd- Davis position with reverse Trendelenberg tilt, was easier and more convenient for surgeon, as later all 76% (32) cases took less than one and half hour for completion of procedure. In the literature, we found no study mentioning use of right lumbar port for

retraction of stomach and for separation of adhesions between liver and stomach in right sub-hepatic space, so as to identify and repair perforation. Majority of the times, it is the liver which is retracted during repair. But in such cases where damage to the liver is possible due to edema and associated inflammation due to perforation peritonitis, it is better to retract stomach at greater curvature with atraumatic grasper so as to make identification and repair of ulcer easy. This method of stomach retraction to identify and repair perforation during laparoscopy repair should be used by the general surgeon in order to avoid trauma to liver.

Further work is needed on laparoscopic approach of perforation repair in order to consolidate these findings.

## LIMITATIONS

We failed to recruit a comparative group with repair of perforation using open approach in early presenting patients. This comparison would have more strongly revealed the benefits of laparoscopic repair. Initial learning curve might be the reason responsible for longer initial duration, so the benefit of less duration in later cases cannot be totally attributed to position of surgeon in between the legs of patient, with patient in Lloyd- Davis position with reverse Trendelenberg tilt.

## CONCLUSION

It appears that the use of laparoscopy for perforated peptic ulcer repair is feasible in earlier presenting patients. Further, the utilization of right lumbar port for stomach retraction should be used during perforation repair to prevent trauma to liver and to aid in better perforation repair under vision.

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Author	Post-operative Complications					Reoperation
	Wound Infection	Prolonged Ileus	Abdominal Collection	Pneumonia	Leakage	
Siu et al.,[22]	3.18%	1.59%	3.18%	0%	1.59%	8%
Katkhouda et al.,[26]	0	6.67%	6.67%	6.67%	-	-
Bergamaschi et al.,[23]	-	0	-	5.89%	-	5.89%
Naesgaard et al.,[29]	4%	-	4%	16%	8%	8%

[Table/Fig-5]: Post-operative complications following laparoscopic perforation repair in literature.

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