

ORIGINAL RESEARCH

A prospective review of laparoscopic repair of perforated peptic ulcer: A case series

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ABSTRACT

Introduction: *The development of laparoscopic surgery has widened up the horizon as approach to abdominal surgery conforms and today provides an option to consider even in abdominal surgical emergencies. In this paper, we would like to highlight our experience of laparoscopic approach to treat early duodenal ulcer perforation emergencies.*

Aims and objectives: *To highlight the results of laparoscopic primary repair of 12 cases of duodenal ulcer perforation.*

Methods: *A hospital-based prospective observational study carried out on 12 patients presenting with duodenal ulcer perforation in the emergency department. The decision to choose between laparoscopic and open approach was based on the discretion of the supervising surgeon, and 12 cases were randomly selected from a spectrum of patients presenting with clinically and radiologically established hollow viscus perforation.*

Conclusion: *. As most of the laparoscopic surgeons are well-acquainted with laparoscopic cholecystectomy, duodenal ulcer perforation repair by laparoscopy can be feasible with intracorporeal suturing skills.*

Keywords: *Laparoscopy, repair, ulcer*

INTRODUCTION

Peptic ulcer perforation is a complication of acute or chronic pre-existing peptic ulcer diathesis. The management of peptic ulcer disease no longer rests upon surgical approach after introduction of effective medical treatment and eradication remedies of H.Pylori infection¹. This has also led to decline in incidence of complications related to peptic ulcer disease. However, there is little detectable changes in incidence of ulcer perforation, and thus, it remains as a surgical emergency and a common indication for an exploratory laparotomy. The development of laparoscopic surgery has widened up the horizon as approach to abdominal surgery conforms and today provides an option to consider even in abdominal surgical emergencies. Laparoscopic repair has been used to treat perforated peptic ulcer and gaining grounds. First description of laparoscopic repair was in 1990 by Mouret et al², when he reported the first laparoscopic sutureless fibrin glue omental patch repair for

perforated duodenal ulcer. The first successful laparoscopic suture repair for perforated peptic ulcer was described by Nathanson et al., also in 1990^{3, 4}. However, despite the great advances in laparoscopic surgery, application of the same in real-life emergencies like duodenal ulcer perforation is challenging. But nevertheless, laparoscopic repair of duodenal perforation seems to be a useful method for reducing hospital stay, complications and return to normal activity if carried on in proper manner.⁵ In this paper, we would like to highlight our experience of laparoscopic approach to treat early duodenal ulcer perforation emergencies.

AIMS AND OBJECTIVES

To highlight the results of laparoscopic primary repair of 12 cases of duodenal ulcer perforation.

METHODS

The present case series was a hospital-based prospective observational study carried out on 12 patients presenting with duodenal ulcer perforation in the emergency department of Assam Medical College and Hospital, Dibrugarh and subjected to emergency laparoscopic surgery for repair, during the period from May 2015 till June 2018. The decision to choose between laparoscopic and open approach was based on the discretion of the supervising surgeon, and 12 cases were randomly selected from a spectrum of patients presenting with clinically and radiologically established hollow viscus perforation. Also a strong clinical suspicion towards Duodenal Ulcer perforation as the likely preoperative diagnosis was taken into account before deciding on a laparoscopic approach for repair. Informed consent was taken for the same.

INCLUSION CRITERIA

- ✓ Patients clinically and radiologically suspected of duodenal ulcer perforation.
- ✓ Patients presenting within 48 hours of onset of symptoms.

EXCLUSION CRITERIA

- Patients of age less than 13 years and above 60 years.
- Patients presenting beyond 48 hours from onset of symptoms.
- Patients with co-morbid conditions like chronic heart failure, chronic kidney disease, chronic obstructive pulmonary disease, and chronic liver disease.
- Patients with previous upper-abdominal surgery.
- Patients with clinically sealed-off perforations without signs of peritonitis or sepsis.
- Patients with suspected alternative diagnosis

Clinical variables were summarized for all patients, and measures of dispersion (mean and median) were used to represent the descriptive data.

WORKING DEFINITIONS

1. Duration of operation or operative time was defined as time from 1st incision to last skin suture.
2. Post-operative pain was estimated by visual analogue scale which has been proven to be a reliable scale upon which post-operative pain can be measured.
3. Hospital stay was defined as time from admission to discharge in terms of days.
4. Pain was assessed on the basis of Visual Analogue Score⁶.

TREATMENT (IMMEDIATE MANAGEMENT, PRE-OPERATIVE EVALUATION AND OPERATIVE PROCEDURE)

IMMEDIATE MANAGEMENT

Patients at presentation were subjected to immediate resuscitative procedures upon clinical suspicion of hollow-viscus perforation based on history and clinical assessment. Administration of two wide-bore cannulas for intra-venous access, one in each upper limb, blood-sampling for necessary investigations and blood grouping and cross-matching, Ryles' tube administration and aspiration, urinary catheter administration for urine output measurement and charting of vitals, input and output were sequentially performed in every patient. All patients received intravenous fluids and parenteral analgesics and intravenous antibiotics after presentation. Peritoneal tap was done to aid the clinical suspicion in the patients. After stabilization of the vitals, patients were sent for radiological examination that consisted of a transabdominal ultrasonography, a chest X-ray PA view and a plain picture of abdomen in erect posture. Presence of echogenic free fluid in the peritoneal cavity or ring-down artifacts on a transabdominal ultrasound were considered highly significant findings to confirm the diagnosis. Presence of gas under the right diaphragm on the plain picture or the chest x-ray was considered a specific evidence to clinch the diagnosis of hollow-viscus perforation. Upon confirmation of hollow-viscus perforation on radiological examination, aided by a clinical suspicion of duodenal ulcer perforation, patients were subjected to a pre-anesthetic evaluation for surgery and accordingly considered for laparoscopic repair in accordance to the inclusion and exclusion criteria of patients for the study.

PRE-OPERATIVE PREPARATION

Patients were evaluated pre-operatively with emphasis on the vitals and available minimum investigation reports (viz. Hb%, platelet count, RBS, B.Urea, S. Creatinine, S. Na⁺, S. K⁺, S. Amylase, S. Lipase including the blood grouping). Storage of minimum one unit of whole human blood was ensured in each case before the surgical procedure. There were no contra-indications for surgery under general anaesthesia in any case. The attendants of the patients were fully informed about the gravity of their illness, requirement of an emergency surgery, risk factors associated with an emergency major abdominal surgery and detailed explanations of the proposed surgical procedure. The available procedures of open surgery and laparoscopic surgery were well-explained. The choice for open versus laparoscopic procedure was offered to the patients, and laparoscopic repair was considered after a fully informed consent was attained from the patient as well as his attendants. Evaluation was followed by immediate transfer of the patient to the operating room.

OPERATIVE PROCEDURE

After the initial measures of resuscitation, stabilization and pre-operative evaluation, the patients were shifted to the OR and anaesthetized. The general procedure in each case consisted of primary repair with conventional 3-stitch omentopexy and peritoneal lavage. The patients were placed in the reverse Trendelenburg position.

- A 10 mm port was created at the umbilicus by open method and trocar placed. Carbon dioxide pneumoperitoneum was created from the umbilical port, and pressure was maintained between 12 and 15 mmHg.
- Another 10mm port was made in the left mid-clavicular line in the left hypochondrium and trocars were positioned.
- Two 5 mm ports were made in the right hypochondrium in the mid-clavicular line and anterior axillary line.
- Laparoscope was inserted through the umbilical port and the peritoneal cavity was

thoroughly examined. The duodenum was carefully examined for presence of perforation.

- In case of presence of omentum over the duodenum, careful removal was done to identify the rent present. The size of the perforation was estimated based on approximation.
- Primary closure was done with 3 bites taken with 2-0 silk sutures or polyglactin sutures (with round bodied 30mm curved needles) about 1 cm from the edge of the perforation.
- An omental patch was laid over it and further reinforced with the silk or polyglactin sutures, each kept sufficiently long for the purpose after primary closure.
- The abdomen was then subjected to thorough lavage with saline and the exudates removed by suction.
- 16F Ryles' tubes introduced through the right trocar site and placed in the hepatorenal space was used as 1st drain. In some cases, another similar tube was used through the left trocar site as pelvic drain.
- The abdomen was closed after thorough inspection and ensuring hemostasis.

RESULTS

12 patients presenting with duodenal ulcer perforation were subjected to laparoscopic repair. All the patients in our study were males and the mean age of the patients was 34.08 ± 10.10 years, with a median age of 35.5 years. (Range: 18-55 years). All the patients presented with the typical features of pain abdomen with distension. . Out of them, one patient had conversion to open surgery as there were significant adhesions around the perforation and the size of the perforation was large (>1.5 cm). The rest of the 11 patients underwent laparoscopic surgery as per planning and their details were recorded. All the patients save one were in shock at the time of presentation and required the usual steps for resuscitation. Other symptoms like fever and respiratory distress were present as well in a few patients, highlighted as others. The duration of symptoms till the time of presentation are shown in table1.

Table 1 showing age, sex, chief modes of presentation to the emergency, and duration of the chief complaints(a,b,c)

PATIENT DEMOGRAPHICS

SerialNo.	Age	Sex	Modes of presentation				Duration		
			Pain abdomen(a)	Distension (b)	Others (c)	Shock	a	b	c
Case 1	18	M	+	+	-	+	6	6	-
Case 2	22	M	+	+	-	+	12	6	-
Case 3	35	M	+	+	+	+	12	12	6
Case 4	27	M	+	+	-	+	24	24	-
Case 5	25	M	+	+	-	-	8	6	-
Case 6	36	M	+	+	+	+	36	24	12
Case 7	28	M	+	+	-	+	12	6	-
Case 8	43	M	+	+	+	+	12	6	6
Case 9	40	M	+	+	-	+	24	12	-
Case 10	51	M	+	+	+	+	24	12	12
Case 11	39	M	+	+	-	+	24	12	-

INTRAOPERATIVE ASPECTS

Serial No	Intra peritoneal collection	Site of perforation	Size of perforation (approx)	Type of repair	Duration of surgery (mins)	Drains placed	Intra op complication
Case 1	Bilious	1st part	1.5 cm	Primary with omentopexy	95	One (sub-hepatic)	None
Case 2	Bilious	1st part	1.0 cm	Primary with omentopexy	75	Two (sub-hepatic and pelvic)	None
Case 3	Bilious	1st part	1.0 cm	Primary with omentopexy	60	One(sub-hepatic)	None
Case 4	Bilious	1st part	1.0 cm	Primary with omentopexy	70	One (sub-hepatic)	None
Case 5	Bilious	1st part	1.5 cm	Primary with omentopexy	65	Two (sub-hepatic and pelvic)	None
Case 6	Bilious	1st part	1.0 cm	Primary with omentopexy	70	Two (sub-hepatic and pelvic)	None
Case 7	Bilious	1st part	1.0 cm	Primary with omentopexy	75	Two (sub-hepatic and pelvic)	None
Case 8	Bilious	1st part	0.5 cm	Primary with omentopexy	60	One(sub-hepatic)	None
Case 9	Bilious	1st part	1.0 cm	Primary with omentopexy	80	One (sub-hepatic)	None
Case 10	Bilious	1st part	0.5 cm	Primary with omentopexy	65	One(sub-hepatic)	None
Case 11	Bilious	1st part	0.5 cm	Primary with omentopexy	65	One (sub-hepatic)	None

Table 2 showing the various intraoperative aspects

Table 2 shows the intraoperative data of the 11 patients that underwent laparoscopic surgery and repair. All the patients had bilious intraperitoneal collection, as revealed on 1st inspection of the peritoneal cavity. All the perforations varying in size from approximately 0.5 cms to 1.5 cms were located on the 1st part of duodenum. The values were based on visual approximation as well as on an idea generated from the blades of the Maryland forceps used to assess the perforation wound.

POST-OPERATIVE ASPECTS:

Event		Median value	Mean value	Mode
Post-operative pain(VAS scale)	24 hours	3 (2-4)	3.27±0.79	4
	48 hours	2(2-3)	2.09±0.30	2
Number of postoperative analgesic injections		4(3-5)	3.27±0.65	4
Duration of nasogastric decompression(days)		2(2-4)	2.27±0.64	2
Day of oral intake (semisolid)		3(3-5)	3.27±0.65	3
Day of drain removal		5(5-7)	5.55±0.80	5
Day of mobilisation		2(2-3)	2.36±0.50	2
Day of discharge		7(6-8)	7.09±0.7	7
Time to return to work		25(15-30)	22.82±4.11	-

Table 3 showing the median day, mean values and mode, of the significant post-operative recovery factors.

The mean operative time in our study was 70 minutes and mean operating time was 70.9±10.2 mins, with a median of 70 mins (Range: 60-95 mins). All patients underwent primary repair followed by omental patch.



Fig 1:A sample picture of a duodenal perforation on laparoscopic view from one of the cases.

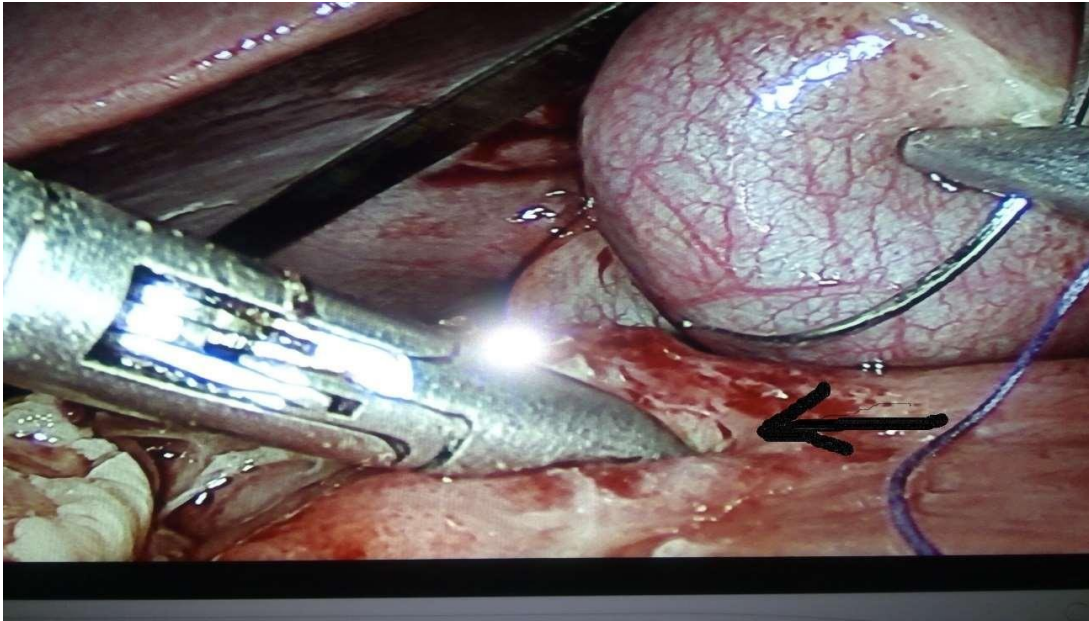


Fig 2: Showing the 1st bite across the perforation.

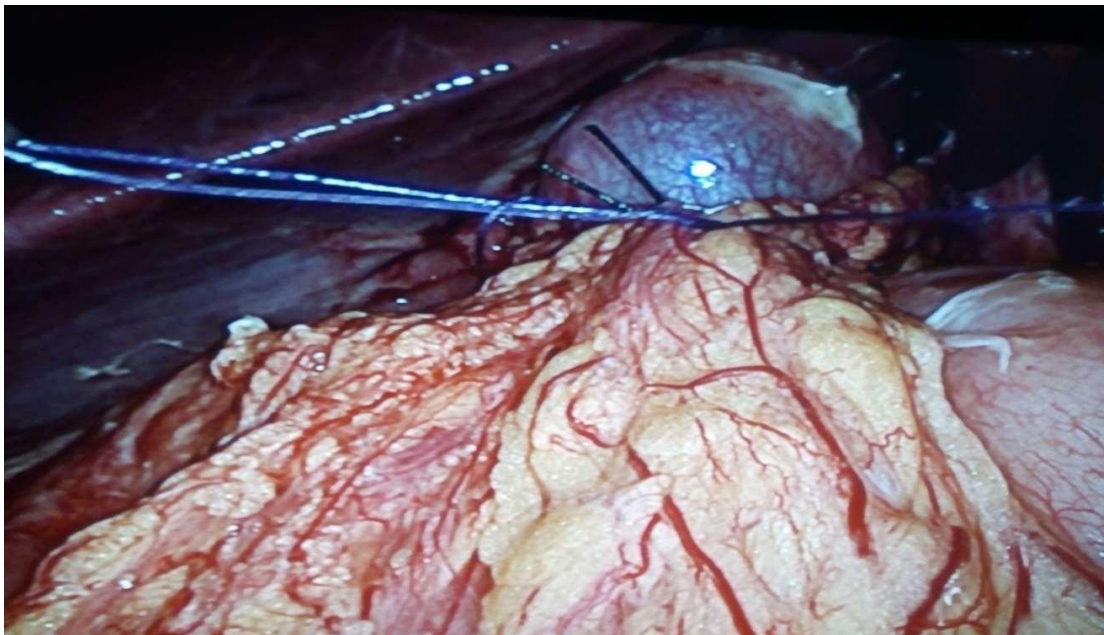


Fig 3: Showing the omental patch held in place by intracorporeal suturing.

Post-operative period was assessed on a daily basis till the day of discharge. Postoperative pain measured on VAS gave a mean value of 3.27 ± 0.79 at 24 hours and 2.09 ± 0.30 at 48 hours, which gives an idea of improvement to a relatively pain-free comfort zone in a short span of time. Mean duration of nasogastric decompression via an indwelling Ryles' tube was 2.27 ± 0.64 days. Liquid intake was allowed and tolerated on all the patients after removal of Ryles' tube, while semisolid diet was started on the following day in most cases. Drains were removed by the 5th to 7th day (5th day on most cases). Most of the patients were mobilised on the 2nd day after surgery (Mean: 2.36 ± 0.50). Most of the patients were discharged on the 7th post-operative day (Mean duration of hospitalisation was 7.09 ± 0.7 , median: 7 (Range: 6-8)).



Fig 4: Showing 1st and 6th post-operative day respectively.

There was no significant postoperative complications in the patients except in one patient who had respiratory complications on the 3rd day and one patient who had a port-site infection. However, this did not affect the duration of hospital stay in either of the patients. There was no mortality in any of the patients under study.

DISCUSSION

The role of laparoscopic surgery in emergencies is well documented.⁷ The change of disease pattern in perforated peptic ulcer favors a simple repair procedure. Surgical approach is the treatment of choice for perforated peptic ulcer according to world journal of emergency surgery guidelines on 2013.⁸ Surgical procedures include simple closure with or without omental patch.⁹ The different techniques described in laparoscopic approach include simple suture, omentopexy with single or three stitches, omental plug with fibrin glue, gelatine sponge closure etc. Omentopexy appears to be the most ideal way of repair keeping abreast with the conventional open technique. Laparoscopic approach can yield several benefits as evidenced in our study. A reduced amount of blood loss, less morbidity and mortality, lower wound infections, shorter hospital stay, less postoperative pain and earlier return to daily activities are some of the perceived advantages.^{10,11}

The mean operative time in our study was 70 minutes and mean operating time was 70.9 ± 10.2 mins, with a median of 70 mins (Range: 60-95 mins). Most of the studies show variable operating times but in general state that this duration in the laparoscopic approach is slightly higher than the open procedures.^{8, 12} Some studies do not show any significant differences between laparoscopic and open repair.¹³ Our experience, and also comparison with some other studies highlights that peritoneal toileting by laparoscopy is a challenging as well as time-consuming part of the procedure.

Our study shows an acceptable score of postoperative pain at 24 hours and at 48 hours (median value of 3 and 2 respectively) on the visual analogue scale. A metaanalysis of 13 publications comprising 658 patients comparing laparoscopic closure of peptic ulcer

perforation found that postoperative pain was less after laparoscopic repair, and associated with lesser postoperative analgesic requirement¹⁴. Our study showed a median value of 4 doses of postoperative analgesic use. It has been established in different studies that the postoperative analgesic use in laparoscopic repair is significantly less than that in open surgery.

Laparoscopic repair is also seen to require less duration of postoperative nasogastric decompression and thus facilitate earlier removal of nasogastric tube (Ryles' Tube). Similar opinion has been reported by other studies like Trejo-Ávila ME et al¹³.

Alemrajabi M et al in their study had reported liquid oral intake by 2nd day without any complications.¹⁵ Palanivelu C et al¹⁶ also demonstrated oral fluid intake in their cases on the 2nd post-operative day. In our study also, liquid oral intake was tried mostly on the 2rd day, the day of nasogastric tube removal. Semisolid food was conveniently allowed and tolerated by our patients on the 3rd day on most occasions, similar to other studies.

Ability for early mobilisation, as early as the 2nd postoperative day is seen to be possible in most patients. Palanivelu et al¹⁶ in their study showed that patients were ambulant after a mean duration of 1.5 days (2.36 ± 0.50 being the mean value in our study). Drains could be conveniently removed by the 5th post-operative day in most of the patients. The mean hospital stay in our series of patients was 7.09 ± 0.7 days (median: 7 days). It is comparable to studies by Palanivelu et al, once again, where the mean duration was 6 days.

Patients were followed up at 1 month and inquired of the day when they resumed their professional activity or returned to work, and as per data, the mean time period in days taken was 22.82 ± 4.11 and a median period of 25 days (Range: 15-30 days). This was comparable to the results by Katkhouda N et al¹². The benefit of early discharge and early return to work may outweigh the consumable cost incurred in the execution of the laparoscopic procedures.

The total trauma incurred by a patient undergoing an operation is the sum of the access trauma and the surgical procedural trauma. When the access trauma of a midline laparotomy is relatively large compared with the procedural, the benefit of minimal-access laparoscopic surgery is seen to be maximized¹⁷. The favourable consequence of these ideas could be easily perceived from the results of our study. With availability of necessary laparoscopic surgical skills, specially with the added ability of intracorporeal suturing methods, laparoscopy can be a feasible option in perforated peptic ulcer patients not belonging to the extremes of age groups (pediatric and geriatric), without any significant co-morbid features and with early presentation to the emergency room. Patients with above features have high likelihood of failure and conversion to open method. Some studies also maintain that symptoms presenting beyond 24 hours also have a high risk of conversion, although in our study, we have taken the cutoff for selection to be 48 hours. Shock on admission, with systolic blood pressure less than 90mm Hg, is also a risk factor for Laparoscopic approach, as per some studies^{18, 19, 20}. Although we have not considered these factors strictly in our study, further continuation of such study on large scale specifically in form of comparison studies as available in literature will help establish the purpose.

CONCLUSION

To conclude, laparoscopic repair of perforated duodenal ulcer is safe and reliable technique. All the advantages of laparoscopic surgery are obtained. Because no upper abdominal incision is made, there is decreased postoperative pain with rapid recovery and fewer complications. Minimal operative scars pertain to the aesthetic concerns, specially young patients. However, laparoscopic closure of the perforation is technically demanding. It should

be considered as a good choice in the presence of reasonable laparoscopic skills and experience. As most of the laparoscopic surgeons are well-acquainted with laparoscopic cholecystectomy, duodenal ulcer perforation repair by laparoscopy can be feasible with intracorporeal suturing skills.

BIBLIOGRAPHY

1. Seelig MH, Seelig SK, Behr C, Schonleben K. Comparison between open and laparoscopic technique in the management of perforated gastroduodenal ulcers. *J Clin Gastroenterol.* 2003;37:201.
2. Mouret P, Francois Y, Vignal J, Barth X, Lombard-Platet R. Laparoscopic treatment of perforated peptic ulcer. *Br J Surg.* 1990; 77(9): 1006.
3. Nathanson LK, Easter DW, Cuschieri A. Laparoscopic repair/ peritoneal toilet of perforated duodenal ulcer. *Surg Endosc.* 1990; 4(4): 232-233.
4. Lau WY, Leow CK. History of perforated duodenal and gastric ulcers. *World J Surg.* 1997; 21(8): 890896.
5. Luncă S, Romedea NS, Moroşanu C. LAPAROSCOPIC REPAIR OF PERFORATED PEPTIC ULCER *Jurnalul de Chirurgie, Iasi, 2007, Vol. 3, Nr. 2 [ISSN 1584 – 9341]*
6. Mathias Haefeli, Achim Elfering. Pain Assessment. *Eur Spine J.* 2006 Jan; 15(Suppl 1): S17-S24
7. Paterson-Brown S. Emergency laparoscopic surgery. *Br J Surg* 1993; 80:279–283.
8. Ahmed AMI, Turkeyev B, Alkatary MMA. Laparoscopic and open repair of perforated peptic ulcer. *International Surgery Journal Ibrahim AAM et al. Int Surg J.* 2017 Jun;4(6):2022-2024
9. Sartelli M, Viale P, Catena F. WSES guidelines for management of intra-abdominal infections. *World J Emerg Surg.* 2013;8(1):3.
10. Zhou C, Wang W, Wang J, Zhang X, Zhang Q, Li B, et al. An updated meta-analysis of laparoscopic versus open repair for perforated peptic ulcer. *Sci Rep.* 2015;5:13976.
11. Antoniou SA, Antoniou GA, Koch O, Pointner R, Granderath FA. Meta-analysis of laparoscopic versus open repair of perforated peptic ulcer. *JLS.* 2013;17:15-22.
12. Katkhouda N et al. Laparoscopic repair of perforated duodenal ulcers, Outcome and Efficacy in 30 consecutive patients. *Arch Surg.* 1999;134:845-850
13. Trejo-Ávila ME et al. . Surgical treatment of perforated gastroduodenal peptic ulcers: comparison between open and laparoscopic approach. *Int Surg J.* 2016 Nov;3(4):1987-1991
14. Lau H. Laparoscopic repair of perforated peptic ulcer: a meta-analysis. *Surg Endosc* 2004;18:1013-21
15. Alemrajabi M, Safari S, Tizmaghz A, Alemrajabi F, Shabestanipour G. Laparoscopic Repair of Perforated Peptic Ulcer: Outcome and Associated Morbidity and Mortality. June 2016, Volume: 8, Issue: 6, Pages: 2543-2545, DOI: <http://dx.doi.org/10.19082/2543>.
16. Palanivelu C, Jani K, Senthilnathan P. Laparoscopic management of duodenal ulcer perforation: is it advantageous? *Indian Journal of Gastroenterology* 2007 Vol 26 March – April 6
17. Tate JJ, Dawson JW, Lau WY, Li AKC. Sutureless laparoscopic treatment of perforated duodenal ulcer. *Br J Surg* 1993; 80:235.
18. Bertleff MJ, Halm JA, Bemelman WA. Randomized clinical trial of laparoscopic versus open repair of the perforated peptic ulcer: the LAMA trial. *World J Surg.* 2009;33(7):1368-73.
19. Siu WT, Leong HT, Law BK. Laparoscopic repair for perforated peptic ulcer: a randomized controlled trial. *Ann Surg.* 2002;235(3):313-9.

20. Bhogal RH, Athwal R, Durkin D, Deakin M, Cheruvu CN. Comparison between open and laparoscopic repair of perforated peptic ulcer disease. *World J Surg.* 2008;32(11):2371-4.