ORIGINAL ARTICLE

COMPARISON BETWEEN LAPAROSCOPIC AND OPEN REPAIR OF PERFORATED DUODENAL ULCER; A RETROSPECTIVE NON-RANDOMIZED CONTROLLED TRIAL

Omar Abdelraheem,[1] *Tarek Talaat*,[2] *Magdy Khalil*,[1] *Ahmed Eisa*[1]

[1]Departments of General Surgery, [2]Pediatric Surgery, Faculty of Medicine, Sohag University, Egypt

Correspondence to: Magdy Khalil, Email: mgkh11@gmail.com

Abstract

Background: Perforation is a common and serious complication of peptic ulcer disease that requires urgent surgical interference .Our aim is to evaluate the effectiveness and postoperative outcome of laparoscopic procedure in repairing perforated duodenal ulcers by comparing this modality with the conventional open surgical repair.

Patients and Methods: A retrospective study of 58 concecutive cases were included and subjected to simple closure of the perforated duodenal ulcers from May 2009 to January 2012 at Sohag University Hospital. Twenty two patients were managed laparoscopically and 36 patients underwent open surgical repair. Demographic data and surgical outcome were compared in both groups.

Results: The operative time in laparoscopic group is more than open group, but without significant statistical difference (p=0.126). Laparoscopic group showed an earlier tolerance to oral feeding (4.26 ± 0.42 vs 5.12± 2.38 days, p=0.04). Additionally, laparoscopic group showed an earlier hospital discharge and return to work than open one (6.63 ± 1.92 vs. 8.24±2.32 days, p=0.026, 20.28 ± 0.16 vs 28.23 ± 0.87 days, p=0.041, respectively). The mean consumed postoperative analgesics per day was less among laparoscopic group (1.7 ± 0.26 vs 3.1 ± 0.34 ampoule/day, p=0.013). The incidence of wound infection, wound dehiscence, prolonged ileus and postoperative pneumonia were more in open group. There were no mortalities in laparoscopic group, but two cases died in open one. Intra-operative conversion to open surgery in laparoscopic group was performed to four cases.

Conclusions: Laparoscopic primary repair of perforated peptic ulcer can be done safely in early cases. It offers less postoperative pain, low incidence of postoperative wound complications , early hospital discharge and return to work, in addition to the cosmetically better outcome. Further training in laparoscopic skills is needed to propose it as a standard method for repair of perforated duodenal ulcers.

Keywords: Laparoscopy, duodenal ulcer, perforation.

INTRODUCTION

The incidence of peptic ulcer disease has declined over the past few years following a more streamlined pharmacological intervention.[1] This can be attributed to the efficiency of histamine H2 blockers and proton

pump inhibitors.[2] Consequently, the elective surgical management of peptic ulcer has been almost eliminated. However, the incidence of perforated duodenal ulcers has remained the same.[3]

Peptic ulcer perforation is a common surgical emergency and a major cause of death in elderly patients. 4,5 Approximately 50% to 60 % of these patients have a history of peptic ulcer disease6, while a smaller number have a history of use of non-steroidal anti-inflammatory drugs (NSAIDs).[7]

Perforated peptic ulcer can be treated by a wide range of options that varies from conservative non-operative treatment to immediate definitive ulcer surgery.[8,9]

H. pylori are now the recognized culprit of the majority of patients with duodenal and gastric ulcers and post eradications ulcer recurrence is uncommon.[10,11]

Operative acid-reduction procedures are not required for this group of patients. As a result, simple closure of the perforation with an omental patch has become the favored management approach in many institutions. It is technically straight forward and reliable and it is also the preferred approach for high-risk patients.[12,13]

In the era of open surgery for perforated peptic ulcer, three prognostic factors (preoperative shock, perforation for more than 24 hours, and associated medical disease) have been identified in patients with perforated peptic ulcer.[14]

Mouret, et al.[15] first described laparoscopic intervention for perforated duodenal ulcer in 1990. Subsequently, this approach has found wide acceptance and has been successfully incorporated into the surgical armamentarium at many hospitals.

Several larger comparative studies have been published confirming the technical feasibility and demonstrating some of the established advantages of the laparoscopic approach.[16-22]

In our locality, this is the first clinical trial to employ the use of laparoscopy in simple closure of perforated duodenal ulcer. Our aim in this study is to evaluate the effectiveness and surgical outcome of laparoscopic approach in repairing perforated duodenal ulcers by comparing this procedure with the traditional open repair.

PATIENTS AND METHODS

This retrospective nonrandomized study was carried out at Sohag University Hospital from May 2009 to January 2012. Only 58 patients confirmed to the selection criteria and informed about pros and cons of each technique. All eligible cases were consented. The study included cases with perforated duodenal ulcers that were submitted to whether laparoscopic or open repair over omental patch. Comparative study was done

between laparoscopic and open groups by assessing; operative time, mean consumed postoperative analgesics per day during the first three days after surgery, early postoperative complications, mortality rate, time to tolerate normal diet and time to return to work.

Preoperative clinical and radiological diagnosis was done to all patients via: full history taking, complete clinical evaluation, routine investigations, plain X-ray chest and abdomen in erect position, and abdominal ultrasound.

Exclusion criteria in both groups included; complicated ulcers with gastric outlet obstruction, patients with previous upper abdominal incision, and patients with serious associated cardiopulmonary disease.

Follow up was limited to the early postoperative period during the first month after surgery in regular outpatient visits every week after hospital discharge for monitoring of postoperative complications. The patients were evaluated clinically and by abdominal ultrasound for suspected cases with an intraperitoneal collection.

Preoperative preparation and resuscitative measures were done to all patients by intravenous fluids, correction of electrolyte imbalance (if present), nasogastric tube decompression, self-retaining urinary catheter to calculate urinary output, intravenous broad spectrum antibiotics and proton pump inhibitor, and urgent surgical interference was performed as soon as the clinical decision to operate.

Surgical procedure: All patients were scheduled to receive endotracheal anesthesia with muscle relaxation. The open repair was performed through upper midline incision. After dissection and division of the inflammatory adhesions, the site of perforation was identified and closed by full thickness suturing using polygalactin No1 suture over a healthy omental patch. Peritoneal toilet was achieved by warm saline solution. Closure of the abdominal incision with two intraperitoneal tube drains, one adjacent to the repair and the other in the pelvis.

Laparoscopic repair was performed as follows: The patient was placed in supine position with head up and the surgeon stood between the legs of the patient. Pneumoperitoneum (below 12 mmHg) was started through an umbilical incision using Hasson open technique to avoid injury of any possible adherent intraperitoneal structures. The umbilical port was used for application of the camera, two working ports were placed on each sides of the camera in triangular fashion at the level of transpyloric plane at the midclavicular line in both sides, and the last port was introduced in the epigastrium for liver and gall bladder retraction as well as irrigation and suction of saline. The assistant retracted the gall bladder and liver upward, blunt and sharp dissection to divide the inflammatory adhesion that was facilitated by using the ultrasonic dissecting

device. Visualization of the site of perforation was supported by irrigation of saline or insufflations of air through the nasogastric tube that showed as escape of saline or air bubbles from perforation site. Meticulous peritoneal lavage was achieved by irrigation and suction of warm saline. Irrigation and suction was performed to all intraperitoneal spaces and pelvic cavity in a dependent position. The perforation was closed by 2-3 stitches with polygalactin No1 suture using healthy omental patch that was inserted beneath the stitches. Drain was put in the subhepatic space at the end of the procedure and the fascia was closed in all ports.

Postoperative management included, intravenous fluids, parenteral broad spectrum antibiotics (Cefepime, 1 gm/12hours and metronidazol, 500 mg/8 hours), nasogastric aspiration and parenteral proton pump inhibitor were used. All patients received an intramuscular ampoule of nalbuphine (20mg) after they regain consciousness as a standard method of postoperative analgesia; additional analgesic ampoules of nalbuphine were given to the patients according to their needs for postoperative pain relief. The mean consumed postoperative analgesic ampoules during the first 3 days after operation were calculated in both groups. Tolerance to oral intake and length of hospital stay were recorded to all patients. We used student's t-test to verify the comparative study between both groups and $p < 0.05$ was considered to be statistically significant.

RESULTS

Laparoscopic omental patch repair was done to 22 patients; during the same period, open repair was performed to 36 patients. Demographic data was recorded in both open and laparoscopic groups as shown in Table 1.

The operative findings and postoperative care were compared in both groups as shown in Table 2. There was significant statistical difference between laparoscopic and open groups as regards; start to oral feeding, duration of nasogastric tube use, mean consumed analgesic during the first three postoperative days, hospital stay and duration of return to work.

Intraoperative conversion to open surgery in laparoscopic group was conducted to four cases as two of them were due to failure of simple closure of extremely friable edge ulcers and the remaining two patients were due to presence of massive adhesions that interfered with visualization of the ulcer site. All cases of conversion to open surgery were presented by abdominal pain more than 24 hours on admission.

The postoperative surgical outcome was recorded and compared in both groups in Table 3. The incidence of wound infection, wound dehiscence, prolonged ileus and postoperative pneumonia were more in open group.

There were no mortalities in laparoscopic group, but two cases died in open group, one of them was due to postoperative pneumonia and the other due to severe postoperative sepsis and pulmonary edema.

Reperforation occurred in 2 and 3 patients of laparoscopic and open group respectively, all of them were reopened surgically and subjected to good drainage with revision of the perforation with omental patch repair.

Table 1. Demographic data of both laparoscopic and open group.

Demographic data	Laparoscopic group	Open group
Number of patients	22	36
Age in years (mean)	52±15.2	55±16.4
Sex (M/F)	18/4	28/8
History of ulcer symptoms	13	21
History of NSAIDs	11	19
Abdominal pain >24 hours	6	11
WBCs count on admission (median)	13x103	14x103

Table 2. Operative findings and postoperative care.

Operative findings	Laparoscopic	Open	P Value
Number of patients	22	36	--
Operative time(min)	112.62±32.43	102.12±42.67	0.126
Conversion to open surgery	4	--	--
Duration of naso-gastric tube use (days)	2.6±2.63	3.79±1.75	0.03
Start to oral feeding (mean by days)	4.26 ± 0.42	5.12 ± 2.38	0.04
Mean consumed analgesic during the first 3 postop. days (ampoules/day)	1.7 ± 0.26	3.1 ± 0.34	0.013
Hospital stay (days)	6.63 ± 1.92	8.24±2.32	0.026
Return to work (mean/days)	20.28 ±0.16	28.23 ± 0.87	0.041

Table 3. Postoperative complications and mortality.

Surgical outcome	Laparoscopic		Open	
	No.	%	No.	%
Wound infections	1	4.5	6	16.7
Wound dehiscence	0	0	4	11
Reperforations	2	9	3	8.3
Prolonged ileus	1	4.5	4	11
Ataelectasis	2	9	1	2.8
Pneumonia	0	0	1	2.8
Mortality	0	0	2	5.6

DISCUSSION

With the recent advances of curative medical treatment for H. pylori, the prevalence and recurrence of peptic ulcer have been significantly declined.[23,24]

Consequently, major acid-reduction surgical procedures are not required for perforated peptic ulcer. As a result, simple closure of the perforation with an omental patch has become the favored option of treatment.[12,13]

The presence of septic peritonitis and associated bad general condition of these patients with perforated duodenal ulcers make us hesitating to employ the use of laparoscopic simple repair. So, this is the first clinical trial to manage these patients laparoscopically in a retrospective study and with a potential patient selection.

In this literature, the demographic data of both laparoscopic and open groups showed that 50% and 53%of patients respectively had a history of NSAIDs use and this was inconsistent with current study that reported a smaller number of NSAIDs intake in patients with perforated peptic ulcers.8This variability may be due to the abuse of NSAIDs in our locality.

We used four port sites to perform the laparoscopic

repair for closure of perforated duodenal ulcers, this is in agreement with many other studies.[1,8,16,17,21,25,26] On the other hand, Lee et al22 in a recent study reported that three port sites are sufficient to do the same procedure.

This variability may be related to the long run of training and technical experience.

In our study, it was found that the operative time in laparoscopic group is more than open group, but without significant statistical difference (P. value 0.126).

This is consistent with many studies,[8,17,21] and inconsistent with other studies.[19,22,25]

However, laparoscopic group of our series showed significant statistical difference in comparison with the open group as regards ; start of oral feeding, duration of nasogastric tube use, hospital stay and return to work. These results agree with many related comparative studies.[1,8,15-19,25,26] Conversion to open surgery varies from 0% up to 60%.27-29 The reported reasons for conversion are, inadequate ulcer localization and large sized ulcer, cardiovascular instability, prolonged perforation more than 24 hours, inadequate instruments, abscess and adhesions.[1,27-30]

In our study, intraoperative conversion to open surgery occurred in four cases (18%) among the laparoscopic group series, all of them presented preoperatively by abdominal pain more than 24 hours on admission, two of them were due to failure of simple closure of the extremely friable edge ulcers and the other two cases due to failure of identification of perforation sites from massive adhesions. It was noticed in our study that laparoscopic repair was achieved safely without surgical conversion in cases that were presented early during the first 24 hours from the onset of perforation. This is consistent with many current comparable studies.[1,29-31]

Our results showed that the reported incidence of wound infections, wound dehiscence and prolonged ileus, were less among the laparoscopic group series in comparison with open group. Many other current studies have similar reported outcomes.[16,17,21,22,25,26,31]

However the incidence of atelectasis was less in the open group. The incidence of postoperative ulcer reperforation was found in 9% and 8.3% of both laparoscopic and open groups respectively. Tissues friability and technical errors were the underlying responsible factors. These recorded incidences were close to the reported results in other parallel studies.[16,18,23,25]

No mortalities were detected in the laparoscopic group, but two cases died among the open group, one of them due to postoperative pneumonia and the other was due to severe sepsis

In conclusions laparoscopic primary repair of perforated peptic ulcer can be done safely in early cases that presented within 24 hours from the onset of perforation. It offers less postoperative pain, low incidence of tissue trauma and postoperative wound complications, early hospital discharge and return to work, in addition to the cosmetically better outcome. Further training in laparoscopic skills is needed to propose it as a standard method for repair of perforated duodenal ulcers.

REFERENCES

1. Lagoo S, McMahon RL, Kakihara M, Pappas TN, Eubanks S. The sixth decision regarding perforated duodenal ulcer. JSLS. 2002;6:359-68.

2. Svanes C, Lie RT, Kvale G, et al. Incidence of perforated ulcer in western Norway, 1935-1990: cohort- or period-dependent time trends? Am J Epidemiol. 1995;141:836-44.

3. Lunevicius R, Morkevicius M. Management strategies, early results, benefits, and risk factors of laparoscopic repair of perforated peptic ulcer.World J. Surg. 2005;29:1299-320.

4. Koo J, Ngan YK, Lam SK. Trends in hospital admissions, perforation and mortality of peptic ulcer in Hong Kong from 1970 to 1980. Gastroenterology. 1983;84:1558–62.

5. Alagaratnam TT, Wong J. No decrease in duodenal ulcer surgery after cimetidine in Hong Kong. J Clin Gastroenterol. 1988;10:25–7.

6. Katkhouda N, Mavor E, Mason RJ, et al. Laparoscopic repair of perforated duodenal ulcers: outcome and efficacy in 30 consecutive patients. Arch Surg. 1999;134:845-50.

7. Bliss DW, Stabile BE. The impact of ulcerogenic drugs on surgery for the treatment of peptic ulcer disease. Arch Surg. 1991;126:609-12.

8. Lau WY, Leung KL, Kwong KH, et al. A randomized study comparing laparoscopic versus open repair of perforated peptic ulcer using suture or sutureless technique. Ann Surg. 1996;224:131-8.

9. Croft TJ, Park KGM, Steele RJC, Chung SSC, et al. A randomized trial of nonoperative treatment for perforated peptic ulcer. N Engl J Med. 1989;320:970-3.

10. NIH consensus development panel. Helicobacter pylori in peptic ulcer disease. JAMA. 1994;272:65–9.

11. Sung JJ, Chung SC, Ling TK, et al. Antibacterial treatment of gastric ulcers associated with Helicobacter pylori. N Engl J Med. 1995;332:139–42.

12. Turner WT, Thompson WM, Thal ER. Perforated gastric ulcers. A plea for management by simple closure. Arch Surg. 1988;123:960–4.

13. Bornman PC, Theodorou NA, Jeffery PC, et al. Simple closure of perforated duodenal ulcer: a prospective evaluation of a conservative management policy. Br J Surg. 1990;77:73–5.

14. Boey J, Wong J, Ong GB. A prospective study of operative risk factors in perforated duodenal ulcers. Ann Surg. 1982;195:265-9.

15. Mouret P, Francois Y, Vignal J, et al. Laparoscopic treatment of perforated peptic ulcer. Br J Surg. 1990;77:1006.

16. Johansson B, Hallerba¨ck B, Glise H, Johnsson E. Laparoscopic suture closure of perforated peptic ulcer A nonrandomized comparison with open surgery. Surg Endosc. 1996;10:656-8.

17. Druart ML, Van Hee R, Etienne J, et al. Laparoscopic repair of perforated duodenal ulcer. A prospective multicenter clinical trial. Surg Endosc. 1997;11:1017-20.

18. Sommer T., H. Elbroend1, H. Friis-Andersen Laparoscopic repair of perforated ulcer in western Denmark – a retrospective study .Scandinavian Journal of Surgery. 2010;99:119–21.

19. Memon MA. Laparoscopic closure of perforated acute duodenal ulcers. Endosurgery. 1996:4:32.

20. Lemaitre J,El Founas W, Chr. Simoens, Chr. Ngongang, Smets D, Mendes P. Surgical Management of Acute Perforation of Peptic Ulcers. A Single Centre Experience. Acta chir belg. 2005;105:588-91.

21. Minutolo vincenzo, giuseppe gagliano, calogero rinzivillo, Orazio minutolo, Maurizio carnazza, agostino racalbuto, salvatore dipietro, giovanni li destri. Laparoscopic surgical treatment of perforated duodenal ulcer .Chirurgia Italiana. 2009:61:309-13.

22. Lee G, Park JK, Kim SG, Choi SH, Yun SS, Lee S, Kwak HY. Laparoscopic Primary Closure: A better method of treatment in perforated peptic ulcer disease than open repair. Journal of Minimally Invasive Surgery. 2012;15.

23. Ormand JE, Talley NJ. Helicobacter pylori: Controversies and an approach to management. Mayo Clin Proc. 1990;65:414–26.

24. Ramsoekh D, van Leerdam M, Rauws E, Tytgat G. Outcome of peptic ulcer bleeding, nonsteroidal anti-inflammatory drug use, and elicobacter pylori infection. Clin Gastroenterol Hepatol. 2005;3:859-64.

25. Siu WT et al. Laparoscopic Repair for Perforated Peptic Ulcer A Randomized Controlled Trial. Annals of Surgery. 2002:235:313–19.

26. Palanivelu C, Kalpesh Jani, Senthilnathan P. Laparoscopic management of duodenal ulcer perforation: is it advantageous Indian Journal of Gastroenterology. 2007;26:64-6.

27. Lee FY, Leung KL, Lai BS, Ng SS, Dexter S, Lau WY. Predicting mortality and morbidity of patients operated on for perforated peptic ulcers. Arch Surg. 2001;136:90-4.

28. Khoursheed M, Fuad M, Safar H, Dashti H, Behbehani A. Laparoscopic closure of perforated duodenal ulcer. Surg Endosc. 2000;14:56-8.

29. Thompson AR, Hall TJ, Anglin BA, Scott-Conner CE. Laparoscopic plication of perforated ulcer: results of a selective approach. South Med J. 1995;88:185-9.

30. So JB, Kum CK, Fernandes ML, Goh P. Comparison between laparoscopic and conventional omental patch repair for perforated duodenal ulcer. Surg Endosc. 1996;10:1060-3.

31. Luncă S, N.S. Romedea, C. Moroşanu laparoscopic repair of perforated peptic ulcer Jurnalul de Chirurgie, Iasi. 2007;3:171-6.