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Original Research Article

Surgical treatment of perforated gastroduodenal peptic ulcers: comparison between open and laparoscopic approach

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ABSTRACT

Background: Laparotomy has long been the standard treatment of perforated peptic ulcers. Laparoscopy allows the confirmation of the diagnosis, better magnified visualization during the procedure and the identification of the position, site and size of the ulcer. The aim of this study is to compare the surgical outcomes of patients with perforated gastric or duodenal peptic ulcers treated either open or laparoscopic in our institution.
Methods: We retrospectively reviewed records of patients with perforated peptic ulcers who underwent laparoscopic repair or open repair, from January 2013 to May 2016 in our hospital. We analyzed preoperative patient baseline parameters, and intraoperative and postoperative outcomes.
Results: Repair of perforated peptic ulcers was performed in 27 patients, using laparoscopic surgery for 14 patients and open surgery for 13 patients. The comparison between the two groups revealed statistically similar results regarding age, gender, BMI and ASA score. Laparoscopic repair was associated with less estimated blood loss (20 vs. 121.5 mL, p=0.025), less duration of nasogastric decompression (1.2 vs. 3.4 days, p=0.000), faster return to diet (2.5 vs. 4 days, p=0.0001) and shorter hospital length of stay (5.5 vs. 7 days, p=0.019). There were no significant differences between the two procedures with regard to operative time (103.9 vs. 101.2 min), use of abdominal drains (71.4% vs. 76.9%) and in-hospital complications (7.1% vs. 15.4%).
Conclusions: Laparoscopic repair of gastroduodenal perforations provides a safe and feasible alternative treatment to perforated gastroduodenal peptic ulcers. Results in our study are in concordance with results published globally.

Keywords: Laparoscopic repair, Open repair, Peptic ulcer disease, Perforated peptic ulcer

INTRODUCTION

The incidence of peptic ulcer disease (PUD) has been decreasing globally due to eradication of *Helicobacter pylori* and use of proton pump inhibitors (PPIs).[1] In despite of this, the incidence of perforated PUD has increased because of the wider use of nonsteroidal anti-inflammatory drugs (NSAIDs).[2]

In Mexico the prevalence of *H. pylori* remains high, with prevalence in the open population of 66% and more than 80% in people older than 26 years.[3]

Emergency surgery usually is essential in PUD complications. Laparotomy has long been the standard treatment of perforated peptic ulcers (PPU).[1]

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.[4-8]

The aim of this study is to compare the surgical outcomes of patients with perforated gastric or duodenal peptic

ulcers treated either open or laparoscopic in our institution.

METHODS

We retrospectively reviewed records of patients with the diagnosis of perforated gastric or duodenal ulcers who underwent laparoscopic or open repair. All patients were treated in our Institution from January, 1 2013 to May, 31 2016. All data obtained from our Institutional Approved Database.

Patients were divided into two groups based in the surgical approach. Patients included in the laparoscopic surgery (LS) group were considered the study group and patients who underwent open surgery (OS) were included in the control group.

All the patients were treated preoperatively by intravenous fluids, a nasogastric suction tube, parenteral analgesics and antibiotics.

Open surgery was performed with midline laparotomy incision, various techniques were used for perforation repair and thorough peritoneal irrigation was required in all cases.

For laparoscopic surgery, pneumoperitoneum was achieved by Veress needle or open Hasson technique. The first trocar was placed in the supra-umbilical position (optic port). Diagnostic laparoscopy was performed in every patient with a 30º laparoscope. Under direct vision, 10- and 5-mm working ports were inserted in the left and right midclavicular line and 5-mm in sub-xiphoid position for liver retraction (Figure 1). The perforation was closed after excision of ulcer margins (Figure 2). Closure was performed with primary suture closure (PC) or primary closure with omental patch (PC + OP) (Figure 3). After closure, intraoperative endoscopy was performed for tissue biopsy and leaking proof, when available. Thorough peritoneal lavage was performed under direct vision with normal saline solution.

Figure 1: Port position for abdominal access for a laparoscopic peptic ulcer repair.

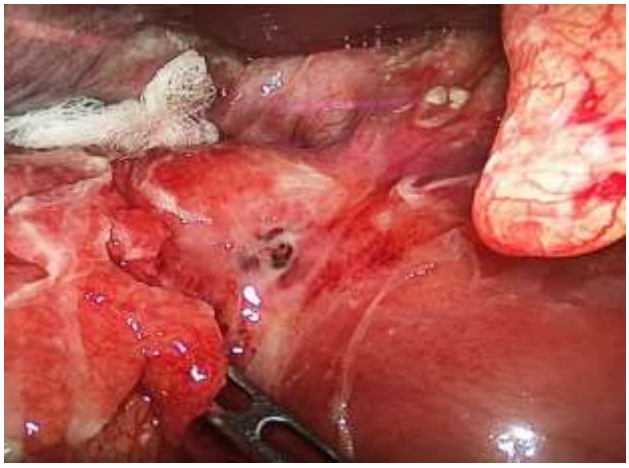

Figure 2: Localization of perforated peptic ulcer before excision of its margins.

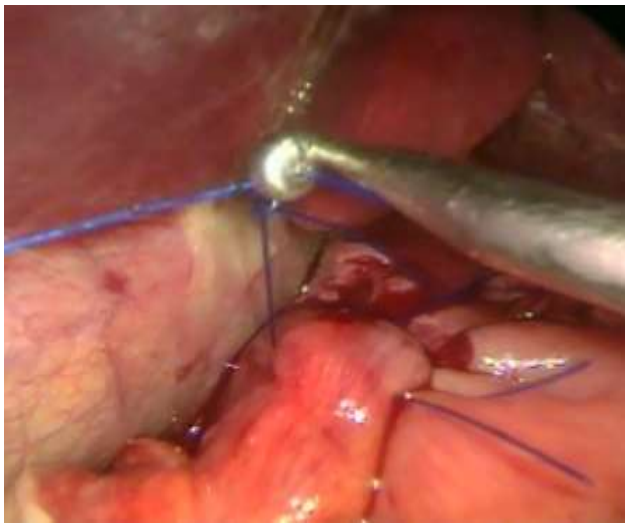

Figure 3: Holding an omental patch with extracorporeal sliding knot and knot pusher device.

We retrospectively analyzed preoperative patient baseline parameters, and intraoperative and postoperative outcomes. The preoperative baseline parameters were: age, sex, body mass index Kg/m^2 (BMI), ASA (American Society of Anesthesiologists) class, comorbidities, and history of tobacco smoking, alcohol drinking and NSAIDs usage. Intraoperative variables included: localization of the perforated ulcer, size of perforation (mm), type of repair (primary closure, primary closure and omental patch and Graham´s patch), use of intraoperative endoscopy, conversion to open approach for laparoscopic cases, operative time (min) and estimated blood loss. And the postoperative variables were: use of abdominal drains, duration of nasogastric decompression (days), time to resume diet (days), hospital length of stay (LOS), in-hospital complications, reoperations, histopathologic results and 30-day mortality.

We reported the data as means (standard deviation), medians (interquartile range) or as the number of patients (percentages). Quantitative and qualitative variables were compared with Student's t-test and the Fischer's exact test or Chi-square test, respectively. The Mann–Whitney U test was used for variables not distributed normally. All statistical tests were two-tailed and a value of $p<0.05$ was considered significant. The data were analyzed using SPSS v18.0 for Windows (SPSS Inc. Chicago, IL, USA).

RESULTS

A total of 27 patients were included in this study, of which 14 patients belonged to the laparoscopic surgery group (LS) and 13 patients to the open surgery group (OS).

Table 1 shows the patient baseline parameters. The comparison between the two groups revealed statistically similar results regarding age, gender, BMI and ASA score, as well as past history of tobacco smoking, alcohol drinking and NSAIDs usage.

Table 2 shows the results of comparisons between both groups. Of the 14 patients included in the LS group 8 (57.1%) had gastric localization, while in the OS group all patients had gastric localization (p=0.016). All ulcers, in both groups, were in the anterior gastric or duodenal surface. We found comparable mean size of perforation between the two groups (8.2 vs 9.8 mm, p=0.298).

Table 1: Patient baseline parameters: laparoscopic surgery (LS) and open surgery (OS) groups.

	LS, n=14	OS, n=13	p<0.05
Age, mean (SD)	46.1 (±18)	58.8 (±16.7)	0.058
Males, n (%)	10 (71.4)	10 (76.9)	0.745
BMI, mean (SD)	28.05 (±4.5)	24.7 (±3.6)	0.065
Comorbidity, n (%) Diabetes Hypertension Others	 1 (7.1) 1 (7.1) 1 (7.1) (PD)	 3 (23.1) 0 3 (23.1) (2 COPD, 1 RA)	0.324
ASA score, n (%) I-II III-IV	 9 (64.3) 5 (35.7)	 5 (38.5) 8 (61.5)	0.179
Risk factors, n (%) Tobacco smoking Alcohol NSAID	 8 (57.1) 8 (57.1) 2 (14.3)	 6 (46.2) 5 (38.5) 2 (15.4)	0.915

SD: standard deviation, BMI: body mass index kg/m^2, PD: Parkinson´s disease, COPD: chronic obstructive pulmonary disease, RA: rheumatoid arthritis, ASA: American Society of Anesthesiologists, NSAID: nonsteroidal anti-inflammatory drugs

Table 2: Comparison of outcomes between laparoscopic surgery and open surgery for perforated peptic ulcers.

	LS, n=14	OS, n=13	p<0.05
Ulcer localization, n (%) Stomach Duodenum	 8 (57.1) 6 (42.9)	 13 (100) 0	0.016
Size of perforation (mm), mean (SD)	8.2 (±5)	9.8 (±4.6)	0.298
Type of reparation, n (%) PC+OP PC GP	 11 (78.6) 3 (21.4) 0	 8 (61.5) 1 (7.7) 4 (30.8)	0.066
Operative time (min), mean (SD)	103.9 (±26)	101.2 (±32.1)	0.575
Estimated blood loss (mL), median (IQR)	20 (20-57.5)	121.5 (±25-200)	0.025
Use of abdominal drain, n (%)	10 (71.4)	10 (76.9)	1.000
Duration of nasogastric decompression (days), (SD)	1.2 (±0.9)	3.4 (±0.9)	0.000
Time to resume diet (days), median (IQR)	2.5 (1-3)	4 (3-5)	0.0001
LOS (days), median (IQR)	5.5 (4-8)	7 (6.5-8.5)	0.019
In-hospital complications, n (%)	1 (7.1)	2 (15.4)	0.595
30-day mortality, n (%)	0	2 (15.4)	0.222

SD: standard deviation, PC + OP: primary closure and omental patch, PC: primary closure, GP: Graham´s patch, IQR: interquartile range.

On regard of the type of reparation, the most common technique in both groups was primary closure with omental patch (n=11/14 (78.6%) vs. n=8/13 (61.5%)), the second commonest technique was primary closure (n=3/14 (21.4%) vs. n=1/13 (7.7%)) and four patients were treated with Graham´s patch in the OS group. No significant difference was found on regard of the type of repair employed (p=0.066).

Laparoscopic repair was associated with less estimated blood loss (20 vs. 121.5 ml, p=0.025), less duration of nasogastric decompression (1.2 vs. 3.4 days, p=0.000),

faster return to diet (2.5 vs. 4 days, p=0.0001) and shorter hospital length of stay (5.5 vs. 7 days, p=0.019).

There were no significant differences between the two procedures with regard to operative time (103.9 vs. 101.2 min) and use of abdominal drains (71.4% vs. 76.9%).

No conversion to open surgery was needed in the LS group. In 7/14 patients of the LS group we performed intraoperative endoscopy, with tissue biopsy and leaking proof. This procedure was never performed in the open surgery group.

A total of three in-hospital complications were registered, 1/14 in LS group and 2/13 in OS group (p=0.595). The patient in the LS group had pulmonary complications and required admission to the intensive care unit (ICU). The two complicated patients in OS group, both were admitted to the ICU, one had cardiac arrest and the other had pulmonary complications, both patients died.

Histopathologic postoperative results showed significant differences in the LS and OS groups: 3/14 vs. 0/13 cases of follicular gastritis associated with Helicobacter pylori, 4/14 vs. 11/13 cases of acute inflammatory and ulcerative changes, 4/14 vs. 1/13 cases of chronic gastritis with H. pylori activity and 3/14 vs. 1/13 cases of complete metaplasia, respectively (p=0.028).

DISCUSSION

The first laparoscopic repair of a PPU, performed in 1990 by Mouret et al, described a sutureless technique in which an omental patch with fibrin glue was used to seal the perforation.[4] At the same time, Nathanson et al described laparoscopic suture closure of perforated ulcers.[5]

Many authors have concluded that both open and laparoscopic repair of PPU are equally effective treatments and several authors have also suggested that laparoscopic surgery is not superior to laparotomy due to a lack of direct tactile sense, longer operative times and difficulty in peritoneal cavity flushing.[6] But recent studies corroborated the benefits of the laparoscopic approach.[6-8]

The advantages of laparoscopic repair (LS) for PPU are; reduced blood loss, less morbidity and mortality, lower wound infections, shorter hospital stay, less postoperative pain and earlier return to daily activities.[6-8] Laparoscopy allows the confirmation of the diagnosis, better magnified visualization during the procedure and the identification of the position, site and size of the ulcer.[2,6] It also allows closure of the perforation and adequate peritoneal lavage without the morbidity of a large abdominal incision.[2] We support these opinions, although laparoscopic expertise is required, defining the characteristics of the ulcer is easier due to better visualization and this helps during the suturing of the perforation.

The first randomized controlled trial comparing laparoscopic and open repair of PPU showed that there was no significant difference in nasogastric tube drainage use, length of hospital stay, and return to normal diet.[9]

In the most recent prospective randomized trial, Ge B et al found no difference in operative times and postoperative complications for LS versus OS.[1] But, they found advantages of laparoscopy in terms of decreased hospital stay and less postoperative pain. Similar total hospital costs existed between laparoscopic and open PPU repairs. These advantages are in concordance with our results.

There seems to be no consensus on how to optimally perform LS repair of PPU.[1] Several options exist; simple suture repair, Graham´s patch, sutured omental patch, sutureless fibrin glue repair and sutureless onlay omental patch.[10,11] And also various laparoscopic techniques for holding an omental patch have been reported, including extracorporeal tying with a knot pusher and automatic stapling.[12] In most of our laparoscopic cases we employed primary closure with suture and reinforcement with omental patch.

Suture dehiscence, the most important complication, represents the first cause of reoperation.[13,14] We found no suture leakage in our patients, using intraoperative endoscopy may help in reduce leaking.

Peritoneal lavage is considered one of the most important parts of surgery, but it consumes the majority of the operative time.[13] On regard of this, laparoscopic surgery allows excellent vision and facilitates irrigation of the suprahepatic and subhepatic spaces, left subdiaphragmatic space, paracolic gutters and pelvic cavity, thus decreasing the risk of intraabdominal abscesses developing.[13,15]

It is reasonable to obtain a biopsy, even with laparoscopy, but this will enlarge the hole and make closure more technically challenging.[16,17] In our technique we excised ulcer borders laparoscopically or took biopsy with intraoperative endoscopy.

Several factors impact in the rate of conversions to open surgery. The conversion rates have ranged from 6 to 30%.[18] One study suggests that laparoscopy tends to be more difficult to perform in older patients and perforations of 1.5 cm or larger and posterior duodenal ulcers were considered the main risk factors for conversion.[13] No conversions to open surgery were required in our study, however all ulcers were in the anterior surface and all perforations measured less than 1.5 cm.

An updated meta-analysis published in 2015, concluded that laparoscopic repair is a feasible and safe option for PPU, and that all the evidences suggest that LS is better

than OS, but more high-quality randomized controlled trials are still needed for further validation.[6]

CONCLUSION

Laparoscopic repair of gastroduodenal perforations provides a safe alternative treatment to perforated gastroduodenal peptic ulcers. Laparoscopic repair for peptic ulcer perforation in our study was associated with less estimated blood loss, less duration of nasogastric decompression, faster return to diet and shorter hospital length of stay. Results in our study are in concordance with results published globally.

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REFERENCES

1. Ge B, Wu M, Chen Q, Chen Q, Lin R, Liu L, et al. A prospective randomized controlled trial of laparoscopic repair versus open repair for perforated peptic ulcers. Surgery. 2016;159 (2):451-8.
2. 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;32:2371-4.
3. Abdo-Francis JM, Uscanga L. Consenso Mexicano sobre Helicobacter pylori. Rev Gastroenterol Mex. 2007;72(3):322-38.
4. Mouret P, Francois Y, Vignal J, Barth X, Lombard-Platet R. Laparoscopic treatment of perforated peptic ulcer. Br J Surg. 1990;77:1006.
5. Nathanson LK, Easter DW, Cuschieri. A Laparoscopic repair/peritoneal toilet of perforated duodenal ulcer. Surg Endosc. 1990;4:232-3.
6. 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.
7. Lunevicius R, Morkevicius M. Systematic review comparing laparoscopic and open repair for perforated peptic ulcer. Br J Surg. 2005;92:1195-207.
8. Antoniou SA, Antoniou GA, Koch O, Pointner R, Granderath FA. Meta-analysis of laparoscopic versus open repair of perforated peptic ulcer. JSLS. 2013;17:15-22.
9. Lau WY, Leung KL. Laparoscopic repair of perforated peptic ulcer. Br J Surg. 1995;82:814-6.
10. Lau WY, Leung KL, Kwong KH, Davey IC, Robertson C, Dawson JJ, 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.
11. Wang YC, Hsieh CH, Lo HC, Su LT. Sutureless Onlay Omental Patch for the Laparoscopic Repair of Perforated Peptic Ulcers. World J Surg. 2014;38:1917-21.
12. Darzi A, Cheshire NJ, Somers SS, Super PA, Guillou PJ, Monson JR. Laparoscopic omental patch repair of perforated duodenal ulcer with an automated stapler. Br J Surg. 1993;80:1552.
13. Guadagni S, Cengeli I, Galatioto C, Furbetta N, Piero VL, Zocco G, et al. Laparoscopic repair of perforated peptic ulcer: single-center results. Surg Endosc. 2014;28:2302-8.
14. Lau H. Laparoscopic repair of perforated peptic ulcer: a meta-analysis. Surg Endosc. 2004;18:1013-21.
15. Crofts TJ, Park KG, Steele RJ, Chung SS, Li AK. A randomized trial of nonoperative treatment for perforated peptic ulcer. N Engl J Med. 1989;320:970-3.
16. Bergamaschi R, Marvik R, Johnsen G, Thoresen JE, Ystgaard B, Myrvold HE. Open vs laparoscopic repair of perforated peptic ulcer. Surg Endosc. 1999;13:679-82.
17. Kirshtein B, Bayme M, Mayer T, Lantsberdg L, Avinoach E, Mizrahi S. Laparoscopic treatment of gastroduodenal perforations. Surg Endosc. 2005;19:1487-90.
18. Bertleff MJOE, Lange JF. Laparoscopic correction of perforated peptic ulcer: first choice? A review of literature. Surg Endosc. 2010;24:1231-9.

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