








Management of peptic ulcer perforations: Comparison of open and laparoscopic procedures

 Selim Birol,¹  Coşkun Çakır,²  Hasan Ökmen,²  Hüseyin Kazım Bektaşoğlu,³
 Abdülhakim İbrahim Ulusoy,⁴  Ufuk Oğuz İdiz,²  Erdem Kınacı²

¹Department of General Surgery, Maltepe C.i.k. State Hospital, İstanbul, Turkey

²Department of General Surgery, İstanbul Training and Research Hospital, İstanbul, Turkey

³Department of General Surgery, Bezmialem Vakıf University, İstanbul, Turkey

⁴Department of General Surgery, Okmeydanı Training and Research Hospital, İstanbul, Turkey

ABSTRACT

Introduction: Peptic ulcer perforation requires urgent surgical intervention, but there is no consensus on a preference for open or laparoscopic surgery. The aim of this study was to compare the results of laparoscopic and open methods of surgery for patients with a peptic ulcer perforation.

Materials and Methods: The data of 52 patients who underwent surgery for peptic ulcer perforation at 4 hospitals were investigated retrospectively. The patients were divided into 2 groups according to the surgical technique applied: open surgery or laparoscopic. Both techniques used an omental patch to repair the perforation. Patient age, gender, preoperative blood white blood cell count, blood amylase level, duration of symptoms before admission to the hospital, length of operation, number of drains, quantity of intra-abdominal free fluid observed during the operation, quantity of fluid used for irrigation, patient abdominal operation history, and complications were noted and analyzed.

Results: Thirty-seven of the patients underwent open surgery and 15 underwent laparoscopic surgery (mean age: 37.73±16.85 years; female/male 3/49). There was no significant difference in the parameters between the groups. No mortality was observed in any of the patients. Wound infection developed in 2 patients who were operated on using the open technique. Only 1 case of laparoscopic surgery (6.66%) was converted to open surgery.

Conclusion: Laparoscopic repair of a peptic ulcer perforation demonstrated results that were similar to open surgery and helps to reduce complications such as wound infection. It may be especially valuable in early-onset cases and younger patients.

Keywords: Infection; laparoscopy; omentum; peptic ulcer.

Introduction

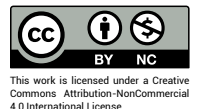
Peptic ulcer perforations are one of the major complications of peptic ulcer. Ulcer perforations can be observed in 10% of the patients with peptic ulcer disease, although

the frequency is extremely diminished, especially in the last 25 years because the peptic ulcers treatment are more effective.^[1,2]



Received: 27.12.2018 Accepted: 10.01.2019

Correspondence: Ufuk Oğuz İdiz, M.D., Department of General Surgery,
İstanbul Training and Research Hospital, İstanbul, Turkey
e-mail: oguzidiz@yahoo.com



This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License.

Peptic ulcer perforation is a condition that requires immediate surgical intervention and open or laparoscopic surgery may be preferred.^[1,3] As is known, most elective open surgeries have more intraoperative blood loss than laparoscopic surgery, more postoperative hospital stay and more postoperative pain.^[4-6] Studies have shown that emergency laparotomy is associated with 5% mortality, 20% morbidity and 3% long term bowel obstruction.^[7]

In the treatment of peptic ulcer perforation, laparoscopic surgery become widespread after the first performed in 1990, but still it couldn't take the place of open surgery today.^[2,8-10] Although some authors have reported that laparoscopic surgery in peptic ulcer perforations has advantages such as less pain and fewer hospitalization than open surgery, some authors suggest that laparoscopic peptic ulcer perforation surgery don't advantageous compared to open surgery because it may last longer ect.^[11-14]

In this study, we evaluated the results of patients who underwent open or laparoscopic surgery for peptic ulcer perforation.

Materials and Methods

Patients who were operated for peptic ulcer perforation between May 2016 and September 2017 at four different hospitals were evaluated retrospectively and included to the study after approval was accepted from local Human Ethical committee (no: 1583). Every patient who were operated were informed about the surgery and signed the informed consent form. Patients who were suspected with gastroduodenal malignancy during operation, with ASA III and IV in the preoperative evaluation, had missing or unrecorded data in the hospital registry system, had iatrogenic gastroduodenal perforations or hemorrhagic ulcers were excluded from the study.

Patients were divided into two groups according to whether the surgical technique applied to the 52 patients included in the study; open or laparoscopic surgery groups. The same two surgeons operated the patients with laparoscopic technique and the other surgeons preferred open surgery. Open surgery was performed with a median incision to the abdomen. After washing the abdomen with 0.9% NaCl, the perforation was repaired with the omental patch. In addition, at least one drain was placed in the subhepatic area in each patient. In laparoscopic surgery, 10 mm trocar was inserted from umbilicus into the abdomen, and laparoscope was placed in this trocar. In addition, two 5 mm trocars were placed right and left

midclavicular line. In the reverse trendelenburg position, the patient's abdomen was washed with 0.9% NaCl and aspirated, then the perforation area was detected. Then, two or three separate 3.0 Vicryl sutures were inserted into the perforation area and the sutures were laparoscopically connected with omental patches. The operation was terminated by placing at least one drain in the subhepatic area from the right 5 mm trocar.

The age, sex, preoperative white blood cell count, blood amylase, operation duration, the amount of fluid used for irrigation of the abdomen, the abdominal operation history of the patients, hospitalization time, the time from the starting of the pain and admission to the hospital, the number of the drains, the amount of intraabdominal free fluid during the operation, postoperative complications (wound infection, intraabdominal hemorrhage, intraabdominal sepsis, etc.) of the patients were noted and compared between the two groups.

Statistical Analysis

Statistical analysis of the study was conducted using the IBM SPSS 15 program. Continuous data were reported as mean \pm standard deviation, and the categorical data were number and percentage. Continuous data with normally distributed were calculated with student t-test. Mann-Whitney U-test was used for the data which were not normally distributed, and Fisher's exact test was used for categorical data. P value <0.05 was accepted as statistical significance.

Results

The 37 of the 52 patients had open surgery and 15 had laparoscopic surgery. The mean age of the patients was 37.73 ± 16.85 years and the female/male ratio was 3/49. All patients participating in the study were evaluated as ASA I or ASA II.

The parameters observed among the groups are shown in Table 1 and Table 2. Despite the fact that no significant difference was observed between the groups in any of the parameters. The age of the patients who underwent open surgery and their preoperative complaints duration were higher than laparoscopic group but there were no statistical differences (Table 1).

No mortality was observed in any of the patients participating in the study, and two of the patients who were operated with open technique had wound infection as a

Table 1. Comparison of continuous data of patients who underwent open and laparoscopic surgery

	Open surgery (n=37)	Laparoscopic surgery (n=15)	p
	Mean±SD	Mean±SD	
Age (year)	40.88±17.41	30.93±13.56	0.053
Preoperative white blood cell (/mm ³)	14071.62±4709.79	11944.67±3458.85	0.120
Preoperative blood amylase (U/L)	76.27±51.33	68.53±19.61	0.575
Duration of complaint before surgery (day)	1.24±0.54	1.00±0.00	0.074
Hospitalization time (day)	6.11±1.72	5.57±1.49	0.192
Duration of the operation (minute)	58.24±15.05	71.67±24.83	0.208
The number of drain	1.78±0.53	1.67±0.48	0.498
Peroperative intraperitoneal free fluid (ml)	398.65±314.35	273.33±123.732	0.288
Amount of irrigation fluid of the abdomen (ml)	4000.00±314.35	3633.33±1043.11	0.949

SD: Standard deviation.

Table 2. Comparison of catagoric data of the patients who underwent open and laparoscopic surgery

	Open surgery (n=37)		Laparoscopic surgery (n=15)		p
	n	%	n	%	
Sex					
Female	2	94.6	1	93.3	1.000
Male	35	5.4	14	6.7	
The history of abdominal operation					
No	34	91.9	15	100	0.548
Yes	3	8.1	0	0	
Postoperative complication					
No	35	94.6	15	100	1.000
Yes	2	5.4	0	0	

postoperative complication. Only one of the patients who underwent laparoscopic surgery (6.66%) converted to open because the perforation diameter was 2 cm.

Discussion

The ideal treatment option for patients with peptic ulcer perforation is primary suturation and irrigation of peritoneal cavity in an emergency manner.^[3] However, it is controversial that whether laparoscopic approach or conventional open surgery should to be choose. Although laparoscopic surgery has great advantages such as short hospital stay, less level of pain, better cosmetic results, it requires a certain learning curve and experiences to gain afformentioned advantages.^[7,15,16,17]

Many studies have been performed regarding minimally invasive treatment for peptic ulcer perforation since the

first report of laparoscopic approach by Mouret et al.^[9] in which better results regarding wound infections and post-operative peritoneal adhesions were reported.^[1,8,17,18]

Operation time is a featuring parameter in the studies comparing laparoscopic and open surgery. There have been incompatible results in the literature regarding operation time. In a study comparing laparoscopic and open surgery for peptic ulcer perforation, operation time was reported significantly longer in laparoscopy group (104 min vs 74 min). According to the authors of that study, it depended to hardness of the intracorporeal suturation and need to longer time for optimal irrigation with laparoscopic devices.^[18] However, no difference related to operation time was also reported in some studies as in our study.^[1,19] Shorter operation time was even reported for laparoscopic surgery.^[20,21]

In a previously published metaanalysis including five randomized controlled trials and 549 cases, postoperative wound infection complication, postoperative pain, and nasogastric tube dependence were significantly less in patients underwent laparoscopic surgery for peptic ulcer perforation.^[1] Additionally, no difference was reported regarding the other parameters, such as intraabdominal abscess formation, pneumonia, fistula or leak, urinary infection, operation time, and hospital stay.^[1] In another study comparing laparoscopic and open surgery for peptic ulcer perforation, although it was not statistically significant, hospital stay was one day less in laparoscopic surgery group.^[17] In the present study, the results were similar with present literature. There were two cases with postoperative wound infection in open surgery group, while no in laparoscopic surgery group.

Conversion to open surgery is a common problem in all types of laparoscopic surgery. In our study, conversion to open surgery was not a great problem, seen in only one case (6.6%). Laparoscopic surgery was not suggested in the presence of hemodynamic instability, location of perforation other than duodenum, and diameter of perforation larger than 1 cm by Siu et al.^[22] due to the high conversion rate. Generally, the rate of conversion to open surgery has been reported between 1.7% to 67.0 % in the literature,^[23] which is compatible with our results.

No mortality was observed in study. In a metaanalysis, the mean mortality rate was reported to be 5.8% after peptic ulcer perforation including ASA III and ASA IV patients.^[24] According to our opinion, the most important reason for the absence of mortality in the present study was the exclusion of these high-risk patients.

The most prominent limitation of the study is decision making for the operation type by the surgeon, that is absence of blindness. Additionally, although it was not statistically significant, the complaints of patients in the laparoscopy group have started shortly before operation and their ages were younger, as shown in Table 1.

In conclusion, laparoscopic surgery could be preferred for peptic ulcer perforation with at least similar results especially in younger patients who admitted to hospital early after the initiation of complaints. Converting to open surgery could be useful if the perforation is larger than 2 cm but prospective randomized controlled trials with larger groups are needed to demonstrate the advantages of the laparoscopy against open surgery and the sugges-

tions for conversion to open surgery in patients with peptic ulcer perforation.

Disclosures

Ethics Committee Approval: The study was approved by the Local Ethics Committee.

Peer-review: Externally peer-reviewed.

Conflict of Interest: None declared.

References

1. Tan S, Wu G, Zhuang Q, Xi Q, Meng Q, Jiang Y, et al. Laparoscopic versus open repair for perforated peptic ulcer: A meta analysis of randomized controlled trials. *Int J Surg* 2016;33 Pt A:124–32.
2. Søreide K, Thorsen K, Harrison EM, Bingener J, Møller MH, Ohene-Yeboah M, et al. Perforated peptic ulcer. *Lancet*. 2015;386:1288–98.
3. Rickard J. Surgery for Peptic Ulcer Disease in sub-Saharan Africa: Systematic Review of Published Data. *J Gastrointest Surg* 2016;20:840–50.
4. de Goede B, Klitsie PJ, Hagen SM, van Kempen BJ, Spronk S, Metselaar HJ, et al. Meta-analysis of laparoscopic versus open cholecystectomy for patients with liver cirrhosis and symptomatic cholelithiasis. *Br J Surg* 2013;100:209–16.
5. Zhou MW, Gu XD, Xiang JB, Chen ZY. Clinical safety and outcomes of laparoscopic surgery versus open surgery for palliative resection of primary tumors in patients with stage IV colorectal cancer: a meta-analysis. *Surg Endosc* 2016;30:1902–10.
6. Quan Y, Huang A, Ye M, Xu M, Zhuang B, Zhang P, et al. Comparison of laparoscopic versus open gastrectomy for advanced gastric cancer: an updated meta-analysis. *Gastric Cancer* 2016;19:939–50.
7. Shih HC, Wen YS, Ko TJ, Wu JK, Su CH, Lee CH. Noninvasive evaluation of blunt abdominal trauma: prospective study using diagnostic algorithms to minimize nontherapeutic laparotomy. *World J Surg* 1999;23:265–69; discussion 269–70.
8. Vărcuș F, Beuran M, Lica I, Turculeț C, Cotarlet AV, Georgescu S, et al. Laparoscopic Repair for Perforated Peptic Ulcer: A Retrospective Study. *World J Surg* 2017;41:948–53.
9. Mouret P, François Y, Vignal J, Barth X, Lombard-Platet R. Laparoscopic treatment of perforated peptic ulcer. *Br J Surg* 1990;77:1006.
10. Nathanson LK, Easter DW, Cuschieri A. Laparoscopic repair/peritoneal toilet of perforated duodenal ulcer. *Surg Endosc* 1990;4:232–3.
11. Bertleff MJ, Halm JA, Bemelman WA, van der Ham AC, van der Harst E, Oei HI, et al. Randomized clinical trial of laparoscopic versus open repair of the perforated peptic ulcer: the LAMA Trial. *World J Surg* 2009;33:1368–73.

12. Siu WT, Leong HT, Law BK, Chau CH, Li AC, Fung KH, et al. Laparoscopic repair for perforated peptic ulcer: a randomized controlled trial. *Ann Surg* 2002;235:313–9.
13. 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;159:451–8.
14. 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.
15. Anbalakan K, Chua D, Pandya GJ, Shelat VG. Five year experience in management of perforated peptic ulcer and validation of common mortality risk prediction models - are existing models sufficient? A retrospective cohort study. *Int J Surg* 2015;14:38–44.
16. Jacobi CA, Ordemann J, Zieren HU, Volk HD, Bauhofer A, Halle E, et al. Increased systemic inflammation after laparotomy vs laparoscopy in an animal model of peritonitis. *Arch Surg* 1998;133:258–62.
17. Smith RS, Sundaramurthy SR, Croagh D. Laparoscopic versus open repair of perforated peptic ulcer: A retrospective cohort study. *Asian J Endosc Surg* 2018. [Epub ahead of print]
18. Lee DJ, Ye M, Sun KH, Shelat VG, Koura A. Laparoscopic versus Open Omental Patch Repair for Early Presentation of Perforated Peptic Ulcer: Matched Retrospective Cohort Study. *Surg Res Pract* 2016;2016:8605039.
19. Schietroma M, Piccione F, Carlei F, Sista F, Cecilia EM, Amicucci G. Peritonitis from perforated peptic ulcer and immune response. *J Invest Surg* 2013;26:294–304.
20. Golash V. Ten-Year Retrospective Comparative Analysis of Laparoscopic Repair versus Open Closure of Perforated. *Oman Med J* 2008;23:241–6.
21. Ates M, Sevil S, Bakircioglu E, Colak C. Laparoscopic repair of peptic ulcer perforation without omental patch versus conventional open repair. *J Laparoendosc Adv Surg Tech A* 2007;17:615–9.
22. Siu WT, Chau CH, Law BK, Tang CN, Ha PY, Li MK. Routine use of laparoscopic repair for perforated peptic ulcer. *Br J Surg* 2004;91:481–4.
23. Teoh AY, Chiu PW, Kok AS, Wong SK, Ng EK. The selective use of laparoscopic repair is safe in high-risk patients suffering from perforated peptic ulcer. *World J Surg* 2015;39:740–5.
24. Bertleff MJ, Lange JF. Laparoscopic correction of perforated peptic ulcer: first choice? A review of literature. *Surg Endosc* 2010;24:1231–9.