Application of Different Surgical Strategies in *Helicobacter pylori*-Associated Gastric Ulcers with Perforation: A Comparative Study of Short-Term and Long-Term Outcomes and Complication Risks

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AIM: This study compared the short- and long-term efficacy of simple suture with omental patch repair (Graham patch) in open surgery versus laparoscopic omental patch repair (LOPR) in treating patients with *Helicobacter pylori* (*H. pylori*)-associated gastric ulcers with perforation, and analyzed the incidence of complications.

METHODS: The clinical information of patients who had stomach perforation repair surgery in Deqing People's Hospital between January 2021 and January 2022 was retrospectively analyzed. The patients were divided into a control group (n = 54), whose subjects underwent the Graham patch repair, and an observation group (n = 52), whose subjects underwent laparoscopic gastric perforation repair. The general characteristics, therapeutic outcomes, intraoperative and postoperative surgical indicators, 1-year postoperative recurrence, and incidence of various postoperative complications were recorded and compared between the two groups.

RESULTS: A total of 106 patients' clinical data were included in the study, of which 52 (49.1%) underwent LOPR and 54 (50.9%) were treated with Graham patch. The general characteristics of the patients in both groups were comparable. The observation group demonstrated significantly better outcomes in terms of operative time, intraoperative blood loss, and postoperative recovery time compared to the control group (p < 0.05). Moreover, the observation group had lower rates of postoperative complications and recurrence compared to the control group (p < 0.05).

CONCLUSIONS: LOPR is a potential therapeutic method for patients with *H. pylori*-associated gastric ulcers with perforations on grounds of its superior efficacy and decreased incidence of comorbidities.

Keywords: Helicobacter pylori; gastric perforation; gastric ulcer; curative effect; complication

Introduction

Helicobacter pylori (H. pylori) infection is a primary cause of gastric ulcer development [1], and if left untreated, it can lead to severe complications such as gastric perforation [2]. Surgical intervention is one of the primary treatments for gastric ulcer, gastric perforation, and associated complications caused by *H. pylori* infection. Among the commonly employed surgical techniques are open surgery and laparoscopic surgery [3]. However, there remains controversy regarding the efficacy and safety of these two surgical approaches in patients with *Helicobacter pylori*-associated gastric ulcers with perforation. In this study, open surgery involved a simple suture with omental patch repair (Graham patch), while laparoscopic surgery employed laparoscopic omental patch repair (LOPR).

Despite the broad utilization of laparoscopic surgery in various surgical procedures due to its minimal invasiveness and rapid recovery, its application in patients with gastric perforation remains challenging. Studies suggest that laparoscopic surgery provides advantages, such as reduced postoperative pain, hospital stay, and recovery time; however, the complexity of intraoperative procedures and the steep learning curve for surgeons have limited its widespread adoption [4–6]. Additionally, the effectiveness of laparoscopic surgery in high-risk patients remains uncertain, particularly in those with severe complications or complex conditions.

In contrast, open surgery, as a traditional surgical approach, is a technically mature and simple technique, but it may engender more trauma and a relatively higher incidence of postoperative complications. Studies have indicated that open surgery may lead to higher postoperative infection rates and a greater risk of long-term complications, such as bowel adhesions and chronic pain [7,8]. Therefore, determining the most appropriate surgical method for differ-

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ent patient populations to minimize postoperative complications remains a critical challenge for clinicians.

This study compared the short- and long-term efficacy and complication rates of different surgical methods in patients with *H. pylori*-associated gastric ulcers with perforation. By analyzing and comparing the differences between laparoscopic surgery and open surgery in terms of postoperative recovery, comorbidity rates, and long-term prognosis, this research seeks to provide evidence-based guidance for clinical treatment. Additionally, the study further explores the effectiveness of different surgical approaches in patients with varying severity of conditions, with the goal of offering insights for selecting appropriate surgical strategies.

Materials and Methods

Study Design

This study retrospectively analyzed the data of patients who underwent surgical treatment for H. pylori-associated gastric ulcers with perforation at Deqing People's Hospital between January 2021 and January 2022. The patients included in this study were treated with LOPR, or Graham patch repair, performed by experienced surgeons. The patients were divided into the observation group whose subjects were treated with LOPR, and the control group whose subjects underwent traditional open repair with an omental patch (Graham patch). The surgical techniques applied to these patients were determined based on their clinical condition and the surgeon's expertise. All patients provided informed consent to participate in this study, and the study was designed in adherence to the principles of the Declaration of Helsinki (2013). This study was approved by the Ethics Committee of Deqing People's Hospital (No. LL2024-K147).

Inclusion criteria for this study are as follows: (1) The patients included in this study met the diagnostic criteria for gastric ulcer with perforation [9]; (2) Gastric ulcer was confirmed by endoscopy, and gastric perforation was confirmed postoperatively; (3) Gastric cancer was excluded following a postoperative pathological examination; (4) The patients were conscious and had stable vital signs; (5) The patients demonstrated good compliance with medical instructions and effectively followed the prescribed guide-lines; (6) *H. pylori* infection was detected by rapid urease test.

Patients demonstrating the following conditions were excluded from this study: (1) Patients with severe heart, brain, liver, kidney, or other major organ diseases, or malignant tumors; (2) Patients who took medications that affect gastrointestinal motility during hospitalization; (3) Patients with impaired consciousness who were unable to complete the study; (4) Patients with a history of previous abdominal surgery.

To control for confounding factors, patients with coexisting medical conditions were excluded to more accurately assess the treatment effects on *H. pylori*-associated gastric ulcers with perforation. In addition, specific exclusion criteria were applied during the subject selection process to ensure consistent clinical characteristics of the study subjects and preclude external variables that may affect efficacy, thereby improving internal validity of the results.

Data utilized in this study, including demographic information and clinical presentations, were sourced from the hospital database. Surgical details such as operation time, intraoperative blood loss, time for resuming peristaltic sound, and anus exhausting time were also recorded. Postoperative outcomes were assessed, including treatment efficacy, recurrence after one year of follow-up, and complication rates. The treatment is considered markedly effective if the patient's clinical symptoms such as high fever and abdominal pain are completely resolved, with complete or near-complete resolution of the ulcer seen in postoperative endoscopy. The treatment is regarded as effective if the patient's clinical symptoms are substantially resolved, and the endoscopy shows occasional activity of the ulcer. The treatment is considered ineffective if there was no significant improvement in clinical symptoms, and the endoscopy shows a progression of the ulcer. The overall efficacy rate can be computed by the following formula = (Number of markedly effective cases + Number of effective cases)/Total number of cases \times 100%. The Visick classification [10] was employed to assess the recurrence status of patients in both groups one year postoperatively. There are four grades in this classification: Grade I for good nutritional status without gastrointestinal symptoms; Grade II for good nutritional status but with mild gastrointestinal symptoms; Grade III for no ulcer recurrence but with moderate dumping syndrome, abdominal distension, and diarrhea; and Grade IV for ulcer recurrence, poor nutritional status, and severe postoperative symptoms that affect normal daily life. The total recurrence rate can be computed by this formula = (Number of Grade III cases + Number of Grade IV cases)/Total number of cases \times 100%. Postoperative complications include incision infections, abdominal infections, bowel obstruction, and incision bleeding.

Surgery Methods

Upon being diagnosed with *H. pylori*-associated gastric ulcer with perforation, the patients were required to abstain from water consumption, with a stomach tube inserted. All patients received intravenous anesthesia combined with tracheal intubation anesthesia. In the control group, patients received Graham patch. A midline incision was made in the upper abdomen to remove intra-abdominal effusion and gastric contents. The abdominal cavity was explored to locate the perforation site. The cavity was thoroughly irrigated with a large volume of warm saline solution. After identifying the location and extent of the perforation, a small tissue sample was collected for pathological exami-

Variable		Control group	Observation group	$\chi^2/t/Z$	р
Candan	Male	26 (48.15%)	30 (57.69%)	0.069	0.225
Gender	Female	28 (51.85%)	22 (42.31%)	0.908	0.323
Age		43 (18, 60)	42 (27, 65)	0.627	0.531
BMI (kg/m ²)		29.56 ± 4.30	30.69 ± 3.37	1.510	0.134
	Primary school or below	20 (37.04%)	19 (36.54%)		
Educational level	Secondary school	27 (50.00%)	28 (53.85%)	0.340	0.844
	University	7 (12.96%)	5 (9.62%)		

Table 1. General characteristics of patients in the two groups.

Note: BMI, body mass index.

Table 2. Comparison of treatment efficacy between the two groups.

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Group	Number of cases	Markedly effective	Effective	Ineffective	Overall efficacy rate
Control group	54	19 (35.19%)	26 (48.15%)	9 (16.67%)	45 (83.33%)
Observation group	52	33 (63.46%)	17 (32.69%)	2 (3.85%)	50 (96.15%)
χ^2					4.682
p					0.030

nation. The full thickness of the gastric wall was sutured intermittently with 3 to 4 stitches, and part of the omental tissue was selected to cover and reinforce the suture site. In the observation group, the preoperative preparation and anesthesia methods were similar to those in the control group. A small incision (approximately 1 cm) was made above the umbilicus, through which a pneumoperitoneum needle was inserted to establish a pneumoperitoneum with a pressure of 12-13 mmHg. After removing the pneumoperitoneum needle, a trocar was introduced into the abdominal cavity, and upon removing the trocar's inner core, a laparoscope was inserted. A 10 mm trocar was placed below the left costal margin along the anterior axillary line, and a 5 mm trocar was inserted at the level of the umbilicus along the midclavicular line. Through the laparoscope, the abdominal cavity was explored to identify the location, extent, and surrounding tissue condition of the gastric perforation. The intra-abdominal effusion and food residue were fully aspirated, and a tissue biopsy was taken at the perforation site of the gastric ulcer for pathological examination. The perforation was then sutured along the long axis of the stomach with 2-3 interrupted stitches using a size 3 absorbable suture, with an edge distance of approximately 0.4 cm and a stitch distance of about 0.5 cm. The perforation was packed with the omentum, and the sutures were tied off. The abdominal cavity was repeatedly irrigated with saline until the outflow was clear, and a drainage tube was placed and secured through the operating port.

Statistical Analysis

Statistical analysis was performed using SPSS 20.0 (IBM Corp., Armonk, NY, USA). Normality of continuous data was evaluated using the Shapiro-Wilk test. Normally distributed continuous data are presented as mean \pm standard deviation. A Student's *t*-test was used for comparing normally distributed data between two samples. Non-normally

distributed continuous data, which show significant deviations from normality (p < 0.05 in the Shapiro-Wilk test), are expressed as median (minimum, maximum), and for these data, the Mann-Whitney U test was used for comparisons between groups. Categorical data are presented as counts and percentages, and comparisons between two samples were conducted using the Chi-square test, which is appropriate for assessing the independence of categorical variables. Statistical significance was considered at p < 0.05.

Results

Comparison of General Characteristics of Patients

No significant differences between the two groups were detected in gender, age, body mass index (BMI), and educational level (p > 0.05). Detailed general characteristics are shown in Table 1.

Comparison of Treatment Efficacy

The overall efficacy rate in the observation group was 96.15%, which was significantly higher than the rate of 83.33% in the control group (p < 0.05), suggesting that LOPR can improve the clinical efficacy in patients with gastric perforation caused by *H. pylori*. Detailed data are shown in Table 2.

Comparison of Intraoperative and Postoperative Observational Indicators

In terms of intraoperative and postoperative observational indicators such as operation time, intraoperative blood loss, time for resuming peristaltic sound, and anus exhausting time, the observation group significantly outperformed the control group ($p \le 0.001$). This suggests that LOPR can effectively improve surgical outcomes and shorten patient recovery time. Detailed data are shown in Table 3.

Group	п	Operation time (min)	Intraoperative blood loss (mL)	Time for resuming peristaltic sound (h)	Anus exhausting time (h)
Control group	54	80.89 ± 12.77	78.57 ± 17.10	31.17 ± 4.44	33.74 ± 6.45
Observation group	52	64.67 ± 10.80	68.52 ± 13.23	20.27 ± 4.26	21.08 ± 3.64
t		7.047	3.377	12.91	12.39
p		< 0.001	0.001	< 0.001	< 0.001

Table 3. Comparison of intraoperative and postoperative observational indicators between the two groups.

Table 4. Comparison of postoperative recurrence between the two grou	ps.
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	Ofade II	Grade III	Grade IV	Total recurrence rate
27 (50.00%)	14 (25.93%)	12 (22.22%)	1 (1.85%)	13 (24.07%)
33 (63.46%)	15 (28.85%)	4 (7.69%)	0 (0.00%)	4 (7.69%)
				5.279
				0.022
	27 (50.00%) 33 (63.46%)	27 (50.00%) 14 (25.93%) 33 (63.46%) 15 (28.85%)	27 (50.00%) 14 (25.93%) 12 (22.22%) 33 (63.46%) 15 (28.85%) 4 (7.69%)	27 (50.00%) 14 (25.93%) 12 (22.22%) 1 (1.85%) 33 (63.46%) 15 (28.85%) 4 (7.69%) 0 (0.00%)

Comparison of Postoperative Recurrence

The one-year follow-up results showed that the total recurrence rate in the observation group was 7.69%, significantly lower than the 24.07% in the control group (p < 0.05). Notably, there were no Grade IV recurrences in the observation group, whereas the control group had a Grade IV recurrence rate of only 1.85%. This indicates that LOPR is an efficient approach to reducing the recurrence rate of *H. pylori*-associated gastric ulcers with perforation. Detailed data are shown in Table 4.

Comparison of Postoperative Complication Rates between the Two Groups

The incidence of postoperative complications, including incision infections, abdominal infection, intestinal obstruction, and intraoperative bleeding, was 3.85% in the observation group, significantly lower than the rate of 25.93% in the control group (p < 0.05). This suggests that LOPR can reduce the occurrence of complications in patients with gastric perforation caused by *H. pylori*. Detailed data are shown in Table 5.

Discussion

The primary objective of this study was to evaluate the clinical efficacy of LOPR versus Graham patch technique in open surgery for patients with *H. pylori*-associated gastric ulcers with perforation. Additionally, this study aimed to compare the short- and long-term outcomes, as well as the incidence of postoperative complications, in patients treated with these two surgical approaches.

Traditional open surgery has a well-established efficacy in the treatment of gastric perforation. However, this technique necessitates larger incision and leads to higher incidence of abdominal infections and higher rates of postoperative comorbidities, which are the apparent reasons causing a gradual shift toward laparoscopic repair techniques in the treatment of gastric perforation [11]. In this study, we observed that the laparoscopic group had significantly shorter operative times and reduced intraoperative blood loss compared to the open surgery group, which is likely attributable to the enhanced visualization afforded by laparoscopy. These findings align with those reported by Chan *et al.* [7]. Through small incisions and the use of imaging equipment, laparoscopic surgery offers a clearer and magnified view of the surgical field, allowing surgeons to explore and manage the site of gastric perforation more rapidly and accurately. The precision of laparoscopic techniques also reduces unnecessary tissue trauma, thereby preserving the integrity of vital intra-abdominal structures and further minimizing blood loss.

Postoperative recovery indicators—specifically, the time for resuming peristaltic sounds and anus exhausting time were significantly shorter in the laparoscopic group. These indicators are commonly used to gauge gastrointestinal function recovery [12]. Shorter recovery times can be explained by the less disturbance instigated by the laparoscopic surgery to the gastrointestinal tract. This is likely because laparoscopic surgery, through minimally invasive techniques, reduces direct traction and damage to the gastrointestinal tract, thereby better preserving its normal physiological functions [13]. Open surgery, due to its larger incisions and associated trauma, tends to cause greater disturbance to gastrointestinal function, which may delay recovery.

Moreover, the laparoscopic group exhibited lower rates of postoperative complications. Specifically, there was a reduced incidence of surgical site infections and wound bleeding, likely due to the smaller incision sizes and decreased tissue trauma inherent to laparoscopic surgery [14]. Furthermore, the incidence of abdominal infection and intestinal obstruction was significantly lower in the laparoscopic group. This may be attributed to the enhanced abdominal visualization in laparoscopic procedures, which enables more thorough irrigation and suction of residual gastric content and lavage fluid [15]. By facilitating the complete removal of abdominal contaminants, laparoscopic surgery reduces the risk of infection and adhesion.

 Table 5. Comparison of postoperative complication rates between the two groups.

Group	n	Infection of incision	Abdominal infection	Intestinal obstruction	Intraoperative bleeding	Total complication rate
Control group	54	7 (12.96%)	3 (5.56%)	2 (3.70%)	2 (3.70%)	14 (25.93%)
Observation group	52	1 (1.92%)	1 (1.92%)	0 (0.00%)	0 (0.00%)	2 (3.85%)
χ^2						10.077
р						0.002

Nonetheless, it is essential to recognize that *H. pylori* infection plays a crucial role in ulcer recurrence; therefore, postoperative eradication therapy is necessary to reduce the recurrence risk [16].

Tulinský *et al.* [17] found that the mortality rate in patients treated with open surgery was significantly higher than in those with laparoscopic surgery. Laparoscopic surgery can minimize exposure of abdominal cavity to the external air, thereby reducing the risk of intraoperative contamination and postoperative infections. In contrast, open surgery, which necessitates larger incisions, increases the likelihood of external contamination of the abdominal cavity, thereby elevating the risk of postoperative infections. Additionally, laparoscopic surgery causes less overall trauma to the body, reducing postoperative pain, shortening recovery times, and improving patients' quality of life.

Nonetheless, open surgery still holds clinical importance, particularly for patients with large perforations or challenging anatomical variations that may complicate laparoscopic access. For instance, open surgery may be a safer choice for patients with severe comorbidities, which can elevate the safety risk during laparoscopic procedures. In cases where significant adhesions or anatomical complexities are encountered, a shift from laparoscopic approach to open surgery may be necessary to ensure patient safety. A recent propensity-matched study reported that conversion rate from laparoscopic surgery was 31% [18], which is substantially higher than the rate of 9.4% reported in another study [3].

It is essential to acknowledge that, despite the benefits of laparoscopic surgery, the procedure requires advanced technical skill and experience, which justifies the need for rigorous surgeon training and technical proficiency to ensure successful outcomes. In complex cases, the need for conversion to open surgery highlights the importance of individualized decision-making. Continued emphasis on skill enhancement and proficiency in laparoscopic techniques will help ensure the safe and effective implementation of this approach.

This study has a few limitations: (1) Owing to the limitations in time, manpower, and budget, only a small-sized sample was obtained, potentially impacting result accuracy. (2) Region-specific characteristics in this singlecenter study may affect generalizability of findings to other populations or settings. Future multicenter studies with larger samples are warranted to enhance rigor and applicability. (3) This retrospective study was conducted using the existing records and only a limited set of indicators were employed for analysis. Prospective studies that adopt a broader range of indicators are required to ensure more comprehensive and scientifically valid results.

Conclusions

In conclusion, LOPR offers significant advantages over the traditional Graham patch technique in the treatment of *H. pylori*-associated gastric ulcers with perforation. The present study demonstrated that the laparoscopic surgery is superior to the conventional technique in terms of shorter operation time, lower intraoperative blood loss, shorter postoperative recovery time, lower incidence of comorbidities, and reduced recurrence rates. Thus, laparoscopic surgery offers a safe and effective option for treatment of this pathological condition. However, owing to the demanding technical and equipment requirements, LOPR should be employed only after considering the patient's specific conditions and the availability of medical resources.

Availability of Data and Materials

The datasets used during the current study are available from the corresponding author on reasonable request.

Author Contributions

JQP and MS conceptualized the research study and designed the experiments. MS and SP performed the data collection and conducted the main experiments. JQP and SP analyzed and interpreted the data. JQP, MS, and SP wrote the initial draft of the manuscript. SP provided critical revisions and was responsible for finalizing the manuscript. All authors contributed to editorial revisions and approved the final manuscript. All authors have participated sufficiently in the work and agree to be accountable for all aspects of the work.

Ethics Approval and Consent to Participate

All patients provided informed consent to participate in this study, and the study was designed in adherence to the principles of Declaration of Helsinki (2013). This study was approved by the Ethics Committee of Deqing People's Hospital (No. LL2024-K147).

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Conflict of Interest

The authors declare no conflict of interest.

References

- Hopkins RJ, Girardi LS, Turney EA. Relationship between Helicobacter pylori eradication and reduced duodenal and gastric ulcer recurrence: a review. Gastroenterology. 1996; 110: 1244–1252.
- [2] Weledji EP. An Overview of Gastroduodenal Perforation. Frontiers in Surgery. 2020; 7: 573901.
- [3] Quah GS, Eslick GD, Cox MR. Laparoscopic Repair for Perforated Peptic Ulcer Disease Has Better Outcomes Than Open Repair. Journal of Gastrointestinal Surgery: Official Journal of the Society for Surgery of the Alimentary Tract. 2019; 23: 618–625.
- [4] Kim HS, Lee JH, Kim MG. Outcomes of laparoscopic primary gastrectomy with curative intent for gastric perforation: experience from a single surgeon. Surgical Endoscopy. 2021; 35: 4206–4213.
- [5] Siu WT, Leong HT, Law BKB, Chau CH, Li ACN, Fung KH, et al. Laparoscopic repair for perforated peptic ulcer: a randomized controlled trial. Annals of Surgery. 2002; 235: 313–319.
- [6] Sanabria A, Villegas MI, Morales Uribe CH. Laparoscopic repair for perforated peptic ulcer disease. The Cochrane Database of Systematic Reviews. 2013; 2013: CD004778.
- [7] Chan KS, Ng STC, Tan CHB, Gerard G, Oo AM. A systematic review and meta-analysis comparing postoperative outcomes of laparoscopic versus open omental patch repair of perforated peptic ulcer. The Journal of Trauma and Acute Care Surgery. 2023; 94: e1–e13.
- [8] 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. International Journal of Surgery (London, England). 2016; 33 Pt A: 124–132.
- [9] Søreide K, Thorsen K, Harrison EM, Bingener J, Møller MH, Ohene-Yeboah M, *et al.* Perforated peptic ulcer. Lancet (London, England). 2015; 386: 1288–1298.

- [10] VISICK AH. A study of the failures after gastrectomy. Annals of the Royal College of Surgeons of England. 1948; 3: 266–284.
- [11] Ukhanov AP, Zakharov DV, Zhilin SA, Bolshakov SV, Muminov KD, Aselderov YA. Laparoscopic treatment of perforated gastroduodenal ulcers. Khirurgiia. 2023; 100–109.
- [12] Jiang T, Li J, Meng L, Wang J, Zhang H, Liu M. Effects of transcutaneous electrical acupoint stimulation on gastrointestinal dysfunction after gastrointestinal surgery: A meta-analysis. Complementary Therapies in Medicine. 2023; 73: 102938.
- [13] Pérez-González C, Ceada G, Matejčić M, Trepat X. Digesting the mechanobiology of the intestinal epithelium. Current Opinion in Genetics & Development. 2022; 72: 82–90.
- [14] Cirocchi R, Soreide K, Di Saverio S, Rossi E, Arezzo A, Zago M, et al. Meta-analysis of perioperative outcomes of acute laparoscopic versus open repair of perforated gastroduodenal ulcers. The Journal of Trauma and Acute Care Surgery. 2018; 85: 417–425.
- [15] Pelloni M, Afonso-Luís N, Marchena-Gomez J, Piñero-González L, Ortíz-López D, Acosta-Mérida MA, *et al.* Comparative study of postoperative complications after open and laparoscopic surgery of the perforated peptic ulcer: Advantages of the laparoscopic approach. Asian Journal of Surgery. 2022; 45: 1007–1013.
- [16] Tarasenko SV, Natalsky AA, Panin SI, Sazhin IV, Yudin VA, Sazhin VP, et al. Modern aspects of the complex treatment of perforated gastric and duodenal ulcer. Khirurgiia (Mosk). 2021; 42–46. (In Russian)
- [17] Tulinský L, Sengul D, Sengul I, Hrubovčák J, Martínek L, Kepičová M, et al. Laparoscopic Repair Modality of Perforated Peptic Ulcer: Less Is More? Cureus. 2022; 14: e30926.
- [18] Coe PO, Lee MJ, Boyd-Carson H, Lockwood S, Saha A. Open Versus Laparoscopic Repair of Perforated Peptic Ulcer Disease: A Propensity-matched Study of the National Emergency Laparotomy Audit. Annals of Surgery. 2022; 275: 928–932.

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