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ORIGINAL ARTICLE

No Abdominal Drainage After Single-Port Laparoscopic Repair for Perforated Duodenal Ulcers

Tri Huu Nguyen [1,2] · Thanh Nhu Dang [2,3]

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Abstract

Nowadays, closure of the perforation with or without omental patch is the main surgical approach for most perforated duodenal ulcer. There have been limited high-quality studies to clarify the role of drainage after perforated duodenal ulcer laparoscopic repair. We performed this study to evaluate the role of abdominal drainage after simple closure for the treatment of low-risk perforated duodenal ulcer. A consecutive case series was conducted including patients with size of duodenal perforation no more than 5 mm who underwent single-port laparoscopic simple repair at Hue University of Medicine and Pharmacy Hospital from January 2012 to June 2018. In this study, sixty-five executive perforated duodenal ulcer patients with the size of the perforation no more than 5 mm, an ASA score equal or less than 3, and a Boey score of 0 or 1 were treated by single-port laparoscopic simple repair. All patients (100%) had a perforation of the anterior side of duodenum. The mean size of the perforations was 3.4 mm. We did not use abdominal drainage after single-port laparoscopic simple closure without omentoplasty. There were no documented leakage of the repair site and no residual abscess postoperatively. The mean analgesic use duration was 2.8 ± 0.8 days. The mean hospital stay duration was 5.6 ± 0.8 days. At 30-day follow-up, one patient (1.5%) had wound infection. No port-site hernia was found and there was no mortality. For small-size and low-risk perforated duodenal ulcer, no-drainage after single-port laparoscopic simple repair is safe and effective. The patients without abdominal drainage require less analgesic use and have short hospital stay.

Keywords Perforated duodenal ulcer · Peptic ulcer · Drain · Single-port laparoscopic · Laparoscopic repair

Introduction

Nowadays, closure of the perforation with or without an omental patch is the main surgical approach for most perforated duodenal ulcer (PDU) [1–4]. Abdominal drainage is frequently used in this procedure [2]. In this case, the aim of drainage is to drain infected or inflammatory tissue fluids and to alarm the anastomotic leakage. However, the role of abdominal drainage remains a matter of controversy in the past and in the present [5–7]. Some studies have demonstrated the inefficacy and even higher complication rates of routine drainage after surgery for PDU [8].

There have been limited high-quality studies to clarify the role and effectiveness of drainage after PDU repair. We performed this study to evaluate the role of abdominal drainage after single-port laparoscopic simple closure for treatment of low-risk PDU.

Patients and Methods

A consecutive case series was conducted including patients with size of duodenal perforation no more than 5 mm who underwent single-port laparoscopic simple repair at Hue University of Medicine and Pharmacy Hospital, a single tertiary care hospital from January 2012 to June 2018.

Surgery was indicated based on clinical findings and evidences of free air on abdominal X-ray, ultrasound, or CT scan. The perforated duodenal ulcer was intra-operatively

✉ Tri Huu Nguyen
nguyenhuutri@hueuni.edu.vn; trihuunguyen@huemed-univ.edu.vn

[1] Department of Anatomy and Surgical Training, Hue University of Medicine and Pharmacy, Hue University, 06 Ngo Quyen street, Hue City, Vietnam

[2] Department of Digestive Surgery, Hue University of Medicine and Pharmacy Hospital, Hue City, Vietnam

[3] Department of Surgery, Hue University of Medicine and Pharmacy, Hue University, Hue City, Vietnam

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confirmed by the position of the perforation distally to the pyloric sulcus or prepyloric vein. Patients were excluded from the study if they had a duodenal perforation greater than 5 mm, gastric outlet obstruction, evidence of bleeding, ASA score>3, or Boey score>1.

Surgical Procedure

Before the operation, a nasogastric tube (NGT) was inserted and intravenous third-generation cephalosporin was used. Under general anesthesia, the patient was placed in a supine position. A vertical incision about 20mm through the patient's umbilicus was performed and carried down to the peritoneum. A SILS™ Port (Covidien, Norwalk, CT, USA) was inserted. Carbon dioxide was insufflated at 12 mmHg. A 5- or 10-mm 30-degree rigid video scope was inserted and the other two trocars were used to operate. A left tilt and a 30-degree reverse Trendelenburg position were used. Conventional straight rigid laparoscopic instruments (including grasper, scissors, and electrocautery, suction irrigator) were used to perform single-port laparoscopic surgery (LSPS). The whole peritoneal cavity was carefully examined and then the perforation site at the duodenum was confirmed. When localization of the perforation was difficult, an additional trocar or a conversion to open surgery was considered. The space around the perforation site was routinely irrigated with warm normal saline followed by suction and irrigation of the pouch of Douglas.

A 2-0 polyglactin suture (Vicryl, Ethicon, Johnson&Johnson, Cincinnati, OH, USA) was used for the repair. The duodenal perforation no more than 5 mm in size was closed by X stitch without omentoplasty.

After repair, the peritoneal lavage was performed with warm normal saline. If pus or digestive fluid was noted on the left side, thorough peritoneal lavage was conducted at the left upper, right upper, left lower, right lower quadrants, and pelvic cavity, respectively. After careful lavage, the incision was closed in two layers.

Postoperative Management

Empiric treatment with intravenous third-generation cephalosporin, metronidazole, and proton pump inhibitors was used. Analgesics with intravenous paracetamol or opioids were used if visual analogue scale (VAS) ≥3. NGT was removed and patients were allowed to resume oral intake when there was evidence of bowel movement. Patients were discharged if oral intake was well tolerated and there were no signs of infection. Routine prescription for *Helicobacter pylori* eradication with triple therapy (amoxicillin, clarithromycin, and proton-pump inhibitor) for 10 days was given at discharge. A clinical follow-up at 4 weeks after the operation was planned.

Results

From January 2012 to June 2018, seventy-five executive PDU patients were treated by single-port laparoscopic simple repair at Hue University of Medicine and Pharmacy Hospital. There were sixty-five patients with the size of the perforation no more than 5 mm and ten patients with the size of perforation larger than 5 mm. In the group with perforation greater than 5 mm, the abdominal drainage was placed in five patients according to the surgeon's preference. These ten PDU patients were excluded from this study.

Clinical Characteristics

The clinical characteristics of the patients are presented in Table 1.

Sixty-five patients met the criteria with the size of duodenal perforation no more than 5 mm, an ASA score equal to or less than 3, and a Boey score of 0 or 1 were analyzed in this study. The mean time from symptom onset until surgery was 7.5 h. There were only two patients (3.1%) having symptom longer than 24 h.

Table 1 Patient demographics

Variables	Value (*n*=65)
Age (years)	48.5 ± 14.9[a]
Sex (man), no. (%)	62 (95.4)
Body mass index (kg/m^2)	19.5 ± 2.1[a]
History of peptic ulcer, no. (%), yes	32 (49.2)
History of NSAID use, no. (%), yes	11 (16.9)
History of previous abdominal surgery, no. (%), yes	3 (4.6)
ASA score	
ASA 1, no. (%)	58 (89.2)
ASA 2, no. (%)	7 (10.8)
Duration from symptom onset until surgery (h)	7.5 ± 5.6[a]
<12, no. (%)	53 (81.5)
12–24, no. (%)	10 (15.4)
>24, no. (%)	2 (3.1)
Boey score	
Boey 0, no. (%)	59 (90.8)
Boey 1, no. (%)	6 (9.2)
Leukocytosis (cells/mm^3)	12.6 ± 4.5[a]
> 10.000, no. (%)	47 (72.3)
≤ 10.000, no. (%)	18 (27.7)

[a] Value is mean ± standard deviation

ASA, American Society of Anesthesiologist; *NSAID*, nonsteroidal anti-inflammatory drugs

Characteristics of Intra-operative Findings

The intra-operative findings of this study are presented in Table 2. All patients (100%) had a perforation of the anterior side of duodenum. The mean size of the perforations was 3.4 ± 1.0 mm. No patient (0%) required conversion to an open operation.

Surgical Outcomes of Single-Port Laparoscopic Simple Closure Surgery Without Drain

The surgical outcomes are presented in Table 3. The mean analgesic use duration was 2.8 ± 0.8 days. The mean hospital stay duration was 5.6 ± 0.8 days. There were no documented leakage of the repair site and no residual abscess postoperatively. At 30-day follow-up, one patient (1.5%) had wound infection. No port-site hernia was found and there was no mortality.

Discussion

Until now, abdominal drainage still remains a topic of unresolved debate [5–7, 9]. Many authors primarily classify abdominal drainage into two groups: for therapeutic vs. for prophylactic reasons. While therapeutic drains are used to drain intra-peritoneal collections of fluid (e.g., pus, blood, or bile), prophylactic drains are used to the anticipation of an intra-peritoneal fluid collection, early inform the surgeon the leakage from high-risk suture lines [5, 7]. However, for emergency abdominal surgery, there is insufficient high-quality evidence in the literature to support or to discourage the use of drain [2].

The role of drainage after abdominal surgeries had been already questioned for a long time ago. Since 1912, Wallace [10] raised his concerns on the ineffectiveness of abdominal drains in removing residual fluid as well as their adverse effects on the abdominal wall. Schein (2008) [7] stated that a well-timed contrast study would be more informative than an ineffective drain.

Table 2 Intra-operative findings

Variables	Value (*n*=65)
Anterior side of duodenal perforation, no. (%)	65 (100.0)
Size of duodenal perforation (mm)	3.4 ± 1.0[a]
Conversion to open surgery, no. (%)	0 (0.0)
Operative time (min)	61.2 ± 23.5[a]

[a] Value is mean ± standard deviation

Table 3 Surgical outcomes

Variables	Value (*n*=65)
Duration of analgesic use (days)	2.8 ± 0.8[a]
Duration of nasogastric tube use (days)	2.9 ± 0.7[a]
Postoperative hospital stay (days)	5.6 ± 0.8[a]
Overall postoperative complications	
Wound infection, no. (%)	1 (1.5)
Port-site hernia and other complications	0
30-day mortality, no.	0

[a] Value is mean ± standard deviation

The same debate exists for the use of drains after surgery for PDU [7]. Some authors still advocate routine use of prophylactic drainage after PDU repair while others disagree [7, 11].

In all 65 patients in the current study with the size of the perforation no more than 5 mm, an ASA score equal or less than 3, and a Boey score of 0 or 1, the mean time from symptom onset until surgery in most cases no longer than 24 h, we did not use abdominal drainage after simple closure without omentoplasty. Postoperatively, there was no residual abscess or fistula.

No-drainage after PDU repair was encouraged by some studies. A prospective study of Pai et al. (1999) [8] comparing 45 non-drain with 75 drain patients after PDU repair showed that drainage did not result in a lower incidence of residual abscess. Suture line leakage was seen in 5.3% and 2.3% in drain and non-drain group, respectively. In addition, insertion site infection was reported in up to 11% patients. Reoperation was required in one patient due to small bowel obstruction around the drain and in one patient with hemorrhage from drain insertion site. The author concluded that drainage after Graham patch repair of PDU was neither safer nor more effective.

Petrowsky et al. (2004) [6] conducted a meta-analysis to determine the role of prophylactic drainage in gastrointestinal surgery. The authors concluded that prophylactic drainage and routine drainage after duodenal surgery with omental patch repair technique was discouraged.

In another study of Ansari et al. (2020) [12] on a total of 114 patients operated for PPU with omental patch technique, the author compared non drain with one drain and multiple drain groups. Postoperative fever, vomiting, laparotomy wound infection, wound dehiscence, and intra-peritoneal collection were noted to be significantly lower in no drain group. The rates of postoperative abdominal distension, pain, intra-abdominal sepsis, gastrointestinal leak, adult respiratory distress syndrome, and mortality were not statistically different between two groups. In addition, drain-related complications were recorded in a

significant portion of patients (36.8%). A prophylactic drainage might not be life-saving since conservative therapy may postpone definitive treatment with reoperation (gastrectomy or tube duodenostomy).

In addition, many authors were also concerned about possible proper complications of the drain including increased postoperative pain, insertion site infection, hemorrhage, fistulas or perforation of a hollow viscus, adhesive bowel obstruction, and incisional hernia [5, 13]. Additional work and manpower were also required for drainage care [14].

In this study, the result of no abdominal drain after PDU repair for low-risk patients was proved to be effective. The mean analgesic use duration was 2.8 ± 0.8 days, the mean hospital stay duration was 5.6 ± 0.8 days, and the mean operative time was 61.2 ± 23.5 min**.**

However, routine use of abdominal drainage after PDU repair was reported in several published studies [15–17]. Supporting the routine drainage standpoint, Okumura et al. (2017) [2] reported a retrospective review using an electronic database of 4869 patients operated for a perforated peptic ulcer (PPU) in Japan with 90.4% of patients receiving drains after surgery. Using propensity score matching analysis, the authors concluded that drainage following PPU repair may help reduce the incidence of postoperative complications that require interventions. In this study, the reported reintervention rate in the no-drain group was 5.6% vs 1.9% in the drain group (p=0.003). This difference between the two groups remained even when complications were subclassified into percutaneous and reoperation groups. The 30-day postoperative in-hospital mortality was also reported to be inferior in the drain group (2.3%) compared to the no-drain group (3.6%). Although it was the first study with large sample with propensity score matching comparison, all of the dates were collected retrospectively and indirectly via electronic database. The heterogeneity of the patient population and surgeon could also affect the results of this study.

Moreover, Schein (2008) [7] believed that the choice of drainage also depended on the surgeon's experience. The drain might be unnecessary for experienced surgeons who know how to do proper and safe repair while it might be justified for junior surgeons who have not reached the top in their learning curve. In Okumura et al.'s study (2017) [2], surgeons in hospitals with higher case volume and a higher number of surgeons tended to avoid routine drainage.

This study has several limitations which should be considered. First of all, it is a non-controlled study and non-randomized study conducted on only small-size, low-risk PDU. An additional randomized controlled trial should be conducted on both low-risk and high-risk PDU (large PDU, comorbidities).

Conclusions

For small-size and low-risk perforated duodenal ulcer, no-drainage after single-port laparoscopic simple repair is safe and effective. The patients without abdominal drainage require less analgesic use and have short hospital stay.

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Declarations

Ethical Approval The study received ethical approval from the ethics committee of Hue University of Medicine and Pharmacy, Hue City, Vietnam.

Conflict of Interest The authors declare no competing interests.

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