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Alif R. Soeratman

Training Program in Surgery, Department of Surgery, Faculty of Medicine Universitas Indonesia, dr. Cipto Mangunkusumo General Hospital, Jakarta, alievrizqy123@gmail.com

Agi S. Putranto

Division of Digestive Surgery, Department of Surgery, Faculty of Medicine Universitas Indonesia, dr. Cipto Mangunkusumo General Hospital, Jakarta, agi.digestive@yahoo.com

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The use of Laparoscopy In Treatment of Perforated Peptic Ulcer: A Literature Review

Alif R. Soeratman,¹ Agi S. Putranto.²

1. Training Program in Surgery, 2. Division of Digestive Surgery, Department of Surgery, Faculty of Medicine Universitas Indonesia, dr. Cipto Mangunkusumo General Hospital, Jakarta.

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Introduction

Perforated peptic ulcer (PPU) is commonly found in the clinic of surgery, with short-term mortality up to 30% and morbidity up to 50%, made PPU one of the fatal surgical emergencies.¹ The prevalence of peptic ulcer has decreased within the last decades globally. According to World Health Organization (WHO, 2011) the mortality rate due to gastric ulcer in Indonesia up to 0.99 percent, which is 8.41 deaths per 100,000 population, though not specific for PPU.² Emergency surgical procedures remains the method of choice.³

The laparoscopic approach has been introduced as an alternative to open surgery procedures.⁴ In the favorable location, treatment of small-sized perforation using the laparoscopic procedure referred to the method of choice in well-developed countries.⁵ With this minimally invasive procedure, patients may have benefit, namely shorter length of hospital stays, relatively minimal pain, minimal scar, and faster postoperative recovery and back to daily activities soon.^{6,7} Although this alternative procedure is more often used in the treatment of PPU, some debates remain concerning the efficacy. Lack of the evidence focused on PPU leading doubts to use such a technique, even though a systematic review proceeded by Sreide et al. (2015) shows the efficacy more than open surgery.⁵ The procedure is not commonly used in Indonesia. The contributing factors are limited resources, including those experts. In addition, delay presented, diagnosis or treatment, referred to Indonesian specific characteristics, where the shock is common to let this acute abdomen developed to sepsis.⁸

The review may explain the role of laparoscopy in PPU management in addition to the morbidity, mortality, and postoperative complications such as surgical site infection, and the recovery time observed from the length of hospital stays. The review may summarize the laparoscopic approach in the treatment of PPU.

Treatment of perforated peptic ulcer

Basically, perforated peptic ulcer may be surgically or non-surgically treated. Non-surgical procedures are merely performed on clinically stable patients with minimal and localized symptoms during observation following an admission. Definitively, PPU should be treated with surgical intervention. About 30-35% of patients treated with septic conditions, which is the leading cause of death, in which 40-50% are fatal.¹ Such cases requiring emergency surgery namely source control with 'quick in and quick out' concept.

Direct closure is the definitive treatment. The procedure may be proceeded conventionally (open abdominal surgery) or using laparoscopy. In the duodenum, ulcer may be closed using the Graham patch technique or primarily approximated covered with an omental patch.⁹ Leaks are the surgeon's concerns. To detect leaks, there are some options. Firstly, filling up the peritoneal cavity with warmed normal saline and flushing air through an inserted nasogastric tube. Bubbles come from approximated perforation denoting leaks. Secondly, using gastrografin contrast radiologically. Conservatively, signs of abdominal abscess should be observed. However, in gastric ulcer, malignancy must be of one consideration: particularly in predicted sites. Biopsy should be carried out, taking a specimen from the ulcer's edge. In this case, radical gastrectomy is the option.

Laparoscopic approach

Surgeons may consider laparoscopy, which is a surgical technique performed on the abdominal and pelvic area through a small incision (sized of 0.5–1.5 cm long) aided by cameras for therapeutic and diagnostic purposes. The first use of the laparoscopy approach treat PPU was first reported in 1990 by Mouret et al.¹⁰ Emergency laparoscopy exploration may be beneficial to identify the pathological cause of acute abdominal pain. Although a non-invasive diagnostic procedure must be performed first.¹⁰ Currently, laparoscopy has been used in acute surgical treatment, including acute appendicitis and PPU.¹¹ The benefits of laparoscopy in the treatment of PPU are the reduced risk of bleeding, smaller incision leading to significant reduction in pain, shorter recovery time, and minimal scar.¹²

However, the shortcoming of laparoscopy in the treatment of PPU is difficulty accessing the perforation and peritoneal decontamination, which ends with conversion.^{11,12}

Surgical Technique

Laparoscopically, the perforated site closed similarly to the techniques used in open abdominal surgery.^{6,13} Patient is positioned at the Trendelenburg of 15–20°. The number, location, and choice of the trocar may differ according to the surgeon's preference and experience and be related to the patient's body shape.¹⁴ Generally, a first 12 mm optical trocar is inserted between or above the umbilical area through a small incision. After the procedure of pneumoperitoneum (alternatively using a Verres needle), the abdominal cavity is explored using a 30° optical camera. The next trocars (usually three trocars required) were placed under visual control. A 5 mm trocar is placed in the epigastric area to lift the liver and, if required, the biliary sac. Both of the other trocars are

placed separately, one in the left abdominal quadrant in the midclavicular line, above the transversal umbilical line (12 mm), and on the right side (5 mm). The position is opposed to the projection plane of the abdominal wall from the transpyloric region. There are several options for trocar positioning, but the ones explained it was ergonomic and the best triangulation between optic and trocars when there are difficulties during laparoscopy.¹⁴

According to Laforgia et al., there were no differences between laparoscopy methods to treat PPU or non-PPU. In the study, patients with peritonitis or sepsis were both enrolled.¹⁵ Usually, no difficult to identify PPU. However, if there is, such as in the lateral wall of the descending duodenum, posterior wall of the stomach, an additional maneuver is required. That intervention may be mobilization of the duodenum or the gastrocolic ligament to access the major omentum retrocavity area. If even after a maneuver, perforation cannot be identified, a conversion should be made. Conversion shouldn't be considered a failure because the identification as well as safety in a perforation should be the priority rather than the choice of surgical access. The benefits of laparoscopy procedure are nothing if the procedure's complexity exceeded the technical ability and minimize the safety of the procedure.¹⁴

Closure of perforation requires the most attention and is completed with extensive cleaning up of the abdominal cavity. To these issues, laparoscopy may require more time than conventional techniques.¹⁴ The method of closure fundamentally depends on the characteristics of the lesion: if the margin is infiltrated, frail, and less immobile, then it should be fixed with omental patch; for margins which can be approximated without tension, direct suture with simple suture with omental flap is adequate. After the omental patch is secured in the position, it's recommended to close the defect in the last 2–3 stitches.¹⁴ Despite the classic method, there were innovation have been proposed to simplify the method: improvement through laparoscopy through one suture, using the clip to strengthen sutures (prevent tying in a suture), through full-thickness self-locking clip, the use of stapler (stapled omental patch repair), and a combination of laparoscopy-endoscopy techniques (gastroscopy-aided repair).^{7,14,16}

Based on the technique of suturing, there were some options. Firstly, direct suture using interrupted simple suture on a defect with no tension when the edges approximated. Secondly, a simple interrupted direct suture covered by pedicled omentoplasty. Thirdly, the Cellan-Jones technique paces pedicled omentum into the defect and closed by purse-string suture. The last is the Graham patch, which patches a defect by placing in free omentum fixed with a purse-string suture.^{14,17} According to the consensus 2012, the choice of closure technique depends on lesion characteristics, which are swollen margins, brittle and hard to move, repair limited to omental patch, which is related to one or two covers. When margins may be approximated without tension, a direct suture is sufficient with or without omentoplasty.¹⁴

A factor that influences the success of laparoscopy treatment is the size of perforation as shown in a study by Varcus (2013) who categorized into groups, based on the perforation of <5 mm and 5 – 10 mm in diameter.¹⁸

The success rate also influences by the operator's capability and experience in laparoscopy affect the success rate. In addition, on the expert's hand, the duration of surgery takes no longer than the laparotomy (Varcus, 2013),¹⁸ Hut (2017),¹⁹ and Agaba (2016).²⁰ There's no conversion recorded in the three studies above.^{18,19,20} Meanwhile, a study by Laforgia (2017) reported one conversion event caused by an unidentifiable perforation site.¹⁵

A good postoperative outcome shown using the laparoscopic procedure even in severe peritonitis. Currently, an adequate lavage may be carried out in the laparoscopic approach, as shown by the study of Varcus (2013).¹⁸ In their study, Varcus (2013), groups treated with laparoscopy were those with ASA I and II categories.¹⁸ In a study by Hut (2017), those with ASA I to ASA IV were included. However, non-complicated outcomes were found in group ASA I.¹⁹ The highest mortality rate was in the ASA IV group. In a study by Hut (2017), patients with ASA V were excluded.¹⁸ Similar findings were reported by Bhat et al. (2017), in which a level increase in ASA status is likelihood to increase the risk of morbidity two times. In that study, mortality was found as 100% in the ASA IV group.²¹

Meanwhile, using the predictors of prognosis such as Boey score, Ge et al. (2016) found no association between the score and the surgical methods approach. In the study two mortalities reported, one died with shock during admission with Boey score 2, and another one died with Boey score 1. However, these reported cases received chemotherapy for lymphoma a week before PPU.²²

Prognosis

In common, clinical predictor to the prognosis were identify using the Boey score system,²³ and APACHE II score that used in critically ill patient in ICU.²⁴ However, in the experts' hand, morbidity and mortality is not significantly different from laparotomy.^{1,18,19,20} Postoperative mortality ranged from 6-10%. Four main factors may increase the mortality rate, even reach up to 100%, which is age >60 years, delay in treatment (>24 hours), shock during treatment (systolic BP <100 mmHg), and comorbid. In addition, gastric ulcer is likely to have 2-3 times increase in mortality risk.¹⁷

Clinical implication

Treatment of perforated peptic ulcers may be proceeded using laparoscopy considering some factors, namely the availability, surgeon's capability, and patient's condition during admission. Risk factors are including comorbid, should be of one consideration. The size of perforation may influence the success rate. The morbidity and mortality are similar to laparotomy; in the experts' hand, Conversion should not be considered a failure, referred to as patient safety, which is the most critical part.

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