



An Overview of Surgical Treatment of Perforated Peptic Ulcer

**Hashem Bark Awadh Abood^{1*}, Rakan Ali Alshehri², Yasir Salah Aljohani³,
Abdullah Yousef Almusallam⁴, Norah Sulaiman Aljabarah⁵, Abeer Ali Hakami⁶,
Talal Mohammed Alzahrani⁷, Ohud Mohammed M. Alqahtani⁸,
Osama Hassan alqahtani⁹ and Ahmed Abdullah Almuhan⁹**

¹*Dr. Samir Abbas Hospital, Jeddah King Fahad Hospital – Albaha, Saudi Arabia.*

²*King Saud bin Abdulaziz University for Health Sciences - College of Medicine, Saudi Arabia.*

³*Taibah University, Saudi Arabia.*

⁴*Qassim University, Saudi Arabia.*

⁵*University of Hail, Saudi Arabia.*

⁶*Jazan University, Saudi Arabia.*

⁷*Faculty of Medicine in Rabigh, King Abdulaziz University, Saudi Arabia.*

⁸*King Khalid University, Saudi Arabia.*

⁹*King Faisal University College of Medicine, Saudi Arabia.*

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

A number of advancements in the therapy of perforated duodenal ulcers have been made in the recent two decades, suggesting that the disease's morbidity and mortality may be reduced. Recently, there has been a return to a more conservative first approach, with reports of either delayed resection or two-stage surgery, in which a non-radical resection is performed first, followed by lymphadenectomy at a later date. Furthermore, because gastric lymphoma can be cured without resection, many upper GI surgeons recommend performing a biopsy and repair at the index operation and then considering how best to continue if adenocarcinoma is discovered later.

Keywords: Surgical treatment; peptic ulcer; duodenal ulcer.

1. INTRODUCTION

A number of advancements in the therapy of perforated duodenal ulcers have been made in the recent two decades, suggesting that the disease's morbidity and mortality may be reduced. These include risk stratification to identify patients who are candidates for various treatment protocols, an expanded role for non-operative treatment, a growing role for laparoscopic surgery, and a more precise identification of patients who are candidates for immediate definitive ulcer management. The function of *Helicobacter pylori* in the aetiology of duodenal ulcer was recently discovered, and it threatens to modify the entire therapeutic algorithm for perforated duodenal ulcer [1].

Every year, 4 million people worldwide suffer from peptic ulcer disease (PUD). The prevalence of PUD has been estimated to be between 1.5 and 3 percent. Peptic ulcer perforation (PPU) is a significant consequence of PUD that commonly manifests as an acute abdomen with a high risk of morbidity and mortality. Perforation occurs in roughly 5% of PUD patients during the course of their lives. PPU has a mortality rate ranging from 1.3 percent to 20%. There have been reports of a 30-day mortality rate of up to 20% and a 90-day mortality rate of up to 30% [2].

When the ulcer is in an unusual position, the standard technique has been to do a wedge excision or even a formal resection at the index procedure. or 'appearances' cancerous, a prospect that can be intimidating to non-specialists. Recently, there has been a return to a more conservative first approach, with reports of either delayed resection or two-stage surgery, in which a non-radical resection is performed first, followed by lymphadenectomy at a later date. Furthermore, because gastric lymphoma can be cured without resection, many upper GI surgeons recommend performing a biopsy and repair at the index operation and then considering how best to continue if adenocarcinoma is discovered later [2].

2. PATHOGENESIS AND EPIDEMIOLOGY

The lifetime prevalence of peptic ulcer disease (PUD) is decreasing, with estimates ranging from 5 to 10%. In industrialized countries, it is far less common. In the same way that the overall incidence of peptic ulcer disease has decreased,

so has the overall rate of complications. Despite the fact that the general rate of complications is decreasing, complications such as bleeding, perforation, and blockage account for about 150,000 hospitalizations in the United States each year. The most prevalent consequence of peptic ulcer disease is upper GI haemorrhage. Perforation is the next most common problem. Upper GI bleeding caused by a peptic ulcer is estimated to occur between 19 and 57 times per 100,000 people each year. Ulcer perforation, on the other hand, is estimated to be 4 to 14 instances per 100,000 people. The fact that 60% of PUD patients are above the age of 60 is a risk factor. The use of nonsteroidal anti-inflammatory medicines (NSAIDs) and *Helicobacter pylori* infections have both been recognized as risk factors for the development of bleeding ulcers and peptic ulcer perforation [4].

Perforation complicates duodenal ulcers roughly half as often as haemorrhage, and the majority of perforated ulcers occur on the duodenum's front side. The patient population is primarily older (mean age 60–70), chronically ill patients who are frequently (40–50%) taking ulcerogenic medications. In the West, the incidence of perforated duodenal ulcer is largely steady, with the age of onset increasing and the sex incidence becoming more evenly distributed [1].

The imbalance between stomach acid-pepsin and mucosal defensive barriers causes peptic ulcer disease (PUD). Every year, it affects 4 million people all around the world. The prevalence of PUD has been estimated to be between 1.5 and 3 percent. Based on hospitalisation data, a systematic analysis of seven studies from industrialised nations estimated yearly incidence rates of PUD to be 0.10 percent to 0.19 percent for physician-diagnosed PUD and 0.03 percent to 0.17 percent for physician-diagnosed PUD. Although 10 percent to 20% of individuals with PUD will develop problems, only 2% to 4% of ulcers will perforate, resulting in an acute sickness. Perforation is a significant complication of PUD, and patients with a perforated peptic ulcer (PPU) frequently arrive with an acute abdomen, which is associated with a high risk of morbidity and mortality. Perforation occurs in roughly 5% of PUD patients during the course of their lives. PPU has a mortality rate ranging from 1.3 percent to 20%. There have been reports of a 30-day mortality rate of up to 20% and a 90-day

mortality rate of up to 30%. We have reviewed the current data on PPU in this review, and we hope that our findings will keep surgeons up to date on evidence-based practice [2,5-16].

Even when ulcers caused by Non-Steroidal Antiinflammatory Drugs are included, *Helicobacter pylori* is found in 70–92 percent of all perforated duodenal ulcers. Ingestion of non-steroidal anti-inflammatory medicines is the second most common cause of perforated duodenal ulcer. In advanced nations, the number of perforated duodenal ulcers linked to nonsteroidal antiinflammatory medicines has risen dramatically, to the point where they now account for 40–50% of perforated duodenal ulcers. Pathologic hypersecretory conditions, such as Zollinger-Ellison syndrome, are the least prevalent cause of recurrent ulcers, but they should be investigated in all cases of recurrent ulcers following effective treatment [1].

3. ETIOLOGY

Patients in developing nations are more likely to be young male smokers, whereas patients in developed countries are more likely to be older with many co-morbidities and NSAID or steroid use. PPU is caused by NSAIDs, *Helicobacter pylori* (*H. pylori*), physiological stress, smoking, corticosteroids, and a history of PUD. Despite successful treatment, recurrence of ulcers is common in the presence of risk factors. The average long-term recurrence of perforation was 12.2 percent, according to a systematic review of 93 research [2,17-27].

4. EVALUATION

The evaluation of a patient with a suspected perforated peptic ulcer should be completed as soon as possible because the morbidity and mortality rates grow dramatically over time. Diagnostic investigations should be obtained to confirm the diagnosis and rule out other probable etiologies, even if a perforated peptic ulcer is suspected based on history and physical examination. Lab tests and imaging examinations are common parts of a typical workup. Complete blood count (CBC), chemical panel, liver function tests, coagulation profile, and lipase levels should all be included in standard labs (to rule out pancreatitis). It's also a good idea to check your blood type and get screened. Patients who fit the systemic inflammatory response syndrome (SIRS) criteria should have blood cultures and lactic acid tests

done. Lactic acid will aid in the detection of coexisting ischemia. Patients with similar pain or urinary symptoms may benefit from a urinalysis [4].

The start of epigastric pain is the most distinguishing sign. The discomfort spreads quickly, however it occasionally goes to the right lower quadrant. The patient is adamant about not moving. There could be a history of dyspepsia, therapy for a duodenal ulcer in the past or present, or use of ulcerogenic medicines. On inspection, the patient appears to be in excruciating discomfort. Hypotension, like a high fever, is a late symptom. The abdominal findings are typically regarded as having a board-like rigidity to them. The patient may improve over time as the intestinal contents are diluted by peritoneal exudate, but this is soon replaced by signs and symptoms of bacterial peritonitis [1].

Once the patient has been stabilized, imaging studies should be obtained. While normal abdominal radiographs or a chest x-ray may show free air, a computed tomography (CT) scan of the belly and pelvis will provide the most diagnostic information. Pneumoperitoneum does not require intravenous (IV) or oral contrast, but IV contrast may be used in patients with nonspecific abdominal pain/peritonitis [4].

5. MANAGEMENT

If left untreated, PPU is a surgical emergency with a high death rate. All patients with PPU require immediate resuscitation, intravenous antibiotics, analgesics, proton pump inhibitory medicines, a nasogastric tube, a urinary catheter, and surgical source control in general.

6. DRUG TREATMENT IN PPU

In the treatment of PPU, omeprazole and triple therapy for *H. pylori* eradication are beneficial adjuncts. Omeprazole with triple therapy treatment has been demonstrated to dramatically lower the rate of recurrence. In the triple therapy eradication group, ulcer healing was significantly higher at the 8-week follow-up endoscopy. In the triple therapy group, 85.3 percent of ulcers were cured, compared to 48.4 percent in the omeprazole alone group. Several other studies from various countries have also shown that eradication of triple therapy after simple PPU closure reduced the incidence of recurrent ulcers. We usually provide an intravenous proton pump inhibitor for 72-96 hours and then start oral

triple treatment right away. Following the completion of medical treatment, we do a urea breath test to confirm *H. pylori* eradication [2].

7. SURGICAL TREATMENT

The time it takes to get surgery has consistently been linked to mortality. For decades, the main method has been laparotomy with perforation closure using interrupted sutures, with or without an omental pedicle on top of the closure. Perforated ulcers are increasingly being repaired laparoscopically, with rates of 30–45 percent reported in recent studies. However, the use of laparoscopy varies from country to country. In a recent study in the United States, just 3% of PPU patients were treated using laparoscopy [28].

A perforation that is too large (i.e. >2 cm) or the inflamed tissues are too friable to allow for a safe primary suture can occur. Furthermore, if a leak occurs after a main repair attempt, a second repair may not be possible. Resection may be a better alternative in some cases. Large stomach ulcers or persistent leaks, in particular, should arouse suspicion of cancer, which can occur in up to 30% of cases in this circumstance. Resection may be used as part of the surgical strategy (distal gastrectomy for gastric ulcer or, formal gastric resections if malignancy is suspected), If the patient is in the pyloric region, a diverting gastrojejunostomy can be used, or a T-drain can be placed if the patient is in the duodenum. 67 Some reports in Japan claim that a higher percentage (up to 60%) of PPU patients are treated with gastric resections rather than primary suture, 68 probably due to tradition and Japan's significantly higher rate of gastric neoplasia [28].

8. VAGOTOMY

By activating parietal cells via cholinergic receptors, the vagus nerve plays a key role in the control of gastrin release and stomach acid output. Vagal activation also causes enterochromaffin like cells and G-cells to release histamine and gastrin, which stimulates the parietal cells to secrete acid. The vagal trunks (truncal vagotomy) or distal nerve fibres are transected during vagotomy (highly selective vagotomy). The goal of truncal vagotomy is to lower gastric acid output and hence the risk of recurrent PUD. Selective vagotomy, which spares the hepatic and celiac divisions of the vagal trunks, is linked to a higher recurrence rate in the long run. As a result, selective vagotomy is

no longer used. According to studies, the ulcer recurrence incidence in perforated duodenal ulcer patients who underwent basic omental patch repair was as high as 42%. Patients who had vagotomy in addition to omental patch repair had much less ulcer recurrence, according to a few prospective randomised studies. Nonetheless, due to the availability of drugs such as histamine receptor antagonists, proton pump inhibitors, and *H. pylori* eradication, vagotomy is now rarely performed for PPU [2,29-32].

During an emergency laparotomy, the indications for elective surgery are still unclear. However, in circumstances when the cases appear early and there are no concomitant conditions, extremely selective vagotomy has been advocated. The inclusion of a definitive surgical operation, such as a Billroth I/II; vagotomy, to an emergency surgery is rarely necessary because it adds operating time, especially in rural settings where presentation to the institute is usually delayed due to low socioeconomic conditions. Primary closure with an omental patch or a final operation in conjunction with closure are also possibilities for stomach perforations. Suffice it to state that simple closure is associated with low mortality and morbidity rate. Resections should be restricted to large ulcers and in early presentations [33].

9. GASTRECTOMY

In 1880, Rydiger performed a partial gastrectomy to treat PUD. Unfortunately, it did not work out. Theodor Billroth successfully performed a gastroduodenostomy in a 43-year-old lady with pyloric cancer a year later. He was the first surgeon to do antral cancer stomach resection. When omental patch repair is not possible due to a big ulcer or a suspicion of cancer, an emergency gastrectomy is performed. In 41 patients who underwent gastrectomy for perforated benign gastric ulcers, a 24 percent death rate was observed in a retrospective review. There were no significant differences in patient recovery after gastrectomy and simple closure repair, according to a study. Increased mortality is linked to longer operating periods, ventilation, and postoperative blood transfusion. The extent of the perforation is linked to increased mortality and anastomotic leak after surgery. It's found that serum albumin is the only preoperative factor predictive of mortality in a study of 601 patients, including 62 patients who underwent gastric resection, and that the outcomes of patients who underwent gastric

resection are inferior to those who underwent omental patch repair, with a mortality risk of 24.2 percent. Gastric resections for acid reduction have become less common since the introduction of proton pump inhibitors, and up to 10% of PPU patients, in our experience, require gastric resection [2,34-41].

10. LAPAROSCOPIC REPAIR

Laparoscopic repair offers its own set of benefits and drawbacks. Laparoscopic surgery is a minimally invasive operation. Reduced post-operative pain, fewer usage of analgesics, and shorter hospital stay are all advantages of laparoscopic repair. Small scars are also proven to reduce wound infections, burst abdomens, and incisional hernias. Longer operating times, a greater rate of re-operations due to leakage at the repair site, and a higher rate of intra-abdominal collection due to inadequate lavage are all disadvantages, not to mention the need for a specialist [33].

11. DATA ANALYSIS

In a study Nine patients were omitted because they had a surgical diagnosis other than a perforated peptic ulcer; 121 patients were included in the final study. Patients ranging in age from 16 to 89 years old were recruited, with 98 men and 23 women. In terms of age, sex, location and amount of perforations, and American Society of Anesthesiology classification, the two groups were comparable. In the laparoscopic group, there were nine conversions. Patients in the laparoscopic group required significantly fewer parenteral analgesics after surgery than those in the open group, and their visual analogue pain scores in days 1 and 3 following surgery were also much lower. The time it took to accomplish the laparoscopic repair was much less than the time it took to do the open repair. The median postoperative stay in the laparoscopic group was 6 days, compared to 7 days in the open group. In the laparoscopic group, there were fewer chest infections. In the laparoscopic group, there were two intraabdominal collections. After surgery, one patient in the laparoscopic group and three patients in the open group died [40].

The Taylor approach of conservative treatment includes Ryles tube aspiration, antibiotics, intravenous fluids, and, more recently, H. pylori triple therapy. A gastroduodenogram, as described by Donovan et al., can be used to

identify patients who are likely to respond to conservative treatment. A randomised trial found that, in patients with a perforated peptic ulcer, an initial period of conservative treatment with careful observation could be safely allowed, except in patients over the age of 70, because such an observation period can prevent the need for emergency surgery in more than 70% of cases. However, in circumstances where the perforation-operation gap is large, this argument will fall apart. Finally, non-operative treatment should only be used in surgically unsuited patients [42].

There were 84 patients in total who were studied. The illness lasted an average of 5.8 days. The majority of patients (69.0%) had never been treated for peptic ulcer disease before. Nonsteroidal anti-inflammatory medicines, alcohol, and smoking were reported by 10.7%, 85.7 percent, and 64.3 percent of those surveyed, respectively. Eight individuals (9.5%) tested positive for HIV, with a median CD4 level of 220 cells/l. The duodenum was the site of the majority of perforations (90.4%), with a duodenal to stomach ulcers ratio of 12.7:1. In 83.3 percent of instances, Graham's omental patch (Graham's omentopexy) of the perforations was performed. The incidence of complications and mortality were 29.8% and 10.7%, respectively. Premorbid disease, HIV status, CD 4 count 200 cells/l, treatment delay, and acute perforation were all substantially linked to consequences. Patients over 40 years of age, delayed presentation (>24 hours), shock upon admission (systolic BP 90 mmHg), HIV positivity, low CD4 count (200 cells/l), stomach ulcers, concomitant disorders, and presence of comorbidities had a significant mortality rate. The average length of stay in the hospital was 14 days. In 82.6 percent of the patients who survived, excellent results were obtained [43].

There were 44 patients identified (25 males and 19 females). The following procedures were performed: 41 omental patch repairs (91%), 2 simple closures (4.5%), and 2 distal gastrectomies (4.5 percent); both for large perforations). Four perforated gastric tumours (8.8%) were found, two of which were suspected intra-operatively and confirmed histologically, one had unexpectedly positive histology, and one had negative intra-operative histology but confirmed the presence of carcinoma on follow-up endoscopy (1 positive biopsy in 21 follow-up endoscopies); all four were managed without initial resection. The average length of stay was

ten days (range: four to 68). At total, 7 patients (15.9%) died in the hospital, with 21 morbidities (54.5 percent). When compared to consultants, registrars conducted the majority of the procedures with no significant difference in post-operative morbidity or death [3].

12. DISCUSSION

The results of a randomized controlled trial in a large sample of patients found that laparoscopic repair is related with a shorter operational time, less postoperative pain and analgesic requirements, a shorter hospital stay, and an earlier return to regular daily activities when compared to open repair. The complication risk for laparoscopic repair was low; compared to open repair, the laparoscopic surgery was associated with fewer chest infections and maybe less wound infection. We are good to say that Perforated peptic ulcer repair with laparoscopic surgery is a safe and effective method. It was linked to a shorter operating time, less postoperative pain, fewer chest problems, a shorter hospital stay after surgery, and a quicker return to regular daily activities than the traditional open repair [42].

Laparotomy and omental patch repair can effectively treat almost all perforated stomach ulcers. To avoid missing an underlying cancer, an initial biopsy and follow-up endoscopy with repeat biopsy are required [3].

A new method known as the "stamp" method, which uses a biodegradable patch made of lactide-glycolide-caprolacton to close the perforation and a glue Glubran 2 made of n-butyl 2 cyanoacrylate 2-octil cyanoacrylate, has been approved for intracorporeal use and is currently being tested in rats with promising results [33].

13. CONCLUSION

There's no doubt that perforated peptic ulcer is serious condition, delayed diagnosis and delayed treatment is linked to high mortality rate. That's means that fast diagnosis can be key factor and most importantly urgent management. Surgical procedures is the way to go for urgent management with laparoscopic repair being safe and effective method and linked to less complication and less hospital stay than traditional surgery. Moreover, there's also newer methods which is being developed such as stamp method.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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