Review Article

Surgical Scales: Primary Closure versus Gastric Resection for Perforated Gastric Ulcer - A Surgical Debate

Mahir Gachabayov, Valentin Babyshin, Oleg Durymanov, Dmitriy Neronov[1]

Departments of Abdominal Surgery and [1]ICU and Anaesthesiology, Vladimir City Clinical Hospital of Emergency Medicine, Vladimir, Russia

Abstract

Perforated gastric ulcer is one of the most life-threatening complications of peptic ulcer disease with high morbidity and mortality rates. The surgical strategy for gastric perforation in contrast with duodenal perforations often requires consilium and intraoperative debates. The subject of the debate is a 59-year-old male patient who presented with perforated giant gastric ulcer complicated by generalized peritonitis and severe sepsis. The debate is based on a systematized table dividing all factors into three groups and putting them on surgical scales. Pathology-related factors influencing the decision-making are size and site of perforation, local tissue inflammation, signs of malignancy, simultaneous complications of peptic ulcer, peritonitis, and sepsis. Besides these factors, patient- and healthcare-related factors should also be considered.

Keywords: *Gastrectomy, gastric resection, gastric ulcer, giant ulcer, perforated ulcer, primary ulcer repair*

Introduction

Perforated peptic ulcers are encountered in 2–14% of patients with complicated peptic ulcer disease.[1] Perforated peptic ulcers, especially gastric ulcers, are associated with high mortality reaching to 41%.[2] Surgical strategy with perforated duodenal ulcers having minimal risk of malignancy is clear, minor surgery being the goal. In case of perforated gastric ulcers (PGUs), almost every operation bears the question: "Which is the best choice? Minor or major surgery? Primary closure or gastric resection?" and requires multidimensional approach. This surgical debate took place in the operation theater.

Discussion

The subject of the debate

Preoperatively

A 59-year-old male patient from a rural place was admitted to Vladimir City Clinical Hospital of Emergency Medicine with 4 days history of abdominal pain, fatigue, and hyperthermia up to 39°C. The onset of pain was sudden and knife-like. His medical history was significant for duodenal ulcer bleeding treated conservatively about 13 years before admission, L1–L2 intervertebral disc hernia for which he had used nonsteroidal anti-inflammatory drugs (NSAIDs). On admission, he had tachypnea (28–30 breaths/min), tachycardia (108 beats/min), hypotension (blood pressure [BP] =80/50 mmHg), and hyperthermia (t = 38.2°C). There were board-like rigidity and positive peritoneal signs. His white blood cells (WBCs) count was 12.5 with 14% band forms. Abdominal X-ray showed free gas under the diaphragm.

A clinical diagnosis of perforated peptic ulcer complicated with peritonitis and sepsis was made. He was resuscitated in the Intensive Care Unit until physiological parameters were stable and transferred to the operating room when his systolic BP was 140 mmHg.

Operation

Laparotomy was performed which revealed generalized peritonitis. Upon revision, a large necrotic defect in the mesocolon was found [Figure 1]. The lesser sac was

Address for correspondence: Dr. Mahir Gachabayov, Department of Abdominal Surgery, Vladimir City Clinical Hospital of Emergency Medicine, 600022, Stavrovskaya Street, 6-73, Vladimir, Russia. E-mail: ggachabayovmahir@gmail.com

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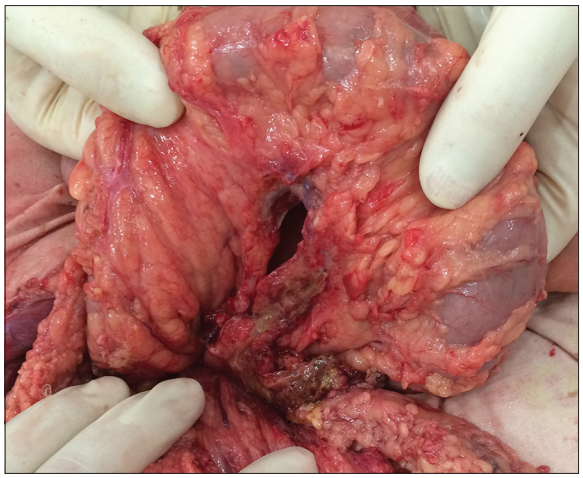

Figure 1: Destructive defect in the mesocolon

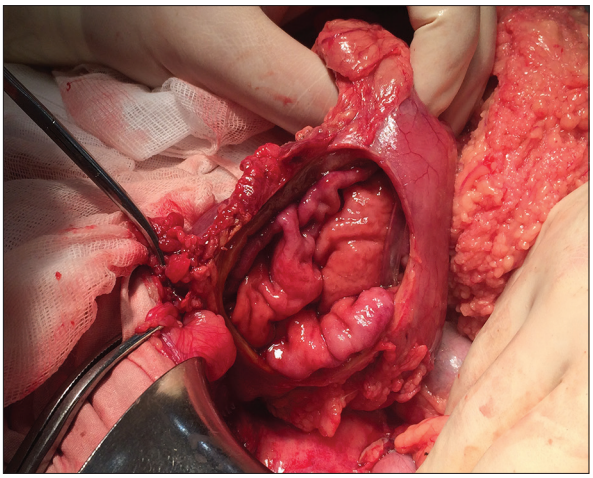

Figure 2: Giant perforated gastric ulcer of the posterior wall of the antrum

opened, and a giant perforating gastric ulcer (with the diameter of 7 cm, Johnson Type V) on the posterior wall of the antrum was found [Figure 2]. The strategic question emerged at this stage: What to do primary repair or gastric resection? To act in the most correct way, a consilium was called to the operation theater, and the strategy was debated. The oral debate in the operation theater took 3 to 5 min. Excision of the ulcer edges with primary repair was the option chosen. A nasogastric tube (for decompression) and nasojejunal tube (for feeding) were placed.

Postoperatively, he received intravenous fluids for 3 days with proton-pump inhibitors and wide-spectrum antibiotics. The patient was fed through the nasojejunal tube for 4 days, and on the 5th postoperative day, the tubes were removed and oral nutrition resumed. The patient recovered uneventfully and was discharged on the 10th postoperative day. The pathologist found no atypical cells in the specimen. On the follow-up after 4 months, the patient was well.

The debate

In the past, gastric resection was the procedure of choice for gastric ulcers. Nowadays, the success in the medical treatment of gastric ulcers changed the vector of choice toward omental patch closure, primary closure, and ulcer excision. Against this background, several factors influence the choice of any of these strategies thus making PGU surgery, a challenge requiring consideration of all these factors promptly. These factors could be classified as it is shown in Table 1.

Pathology-related factors: Pathomorphological factors

The size of perforation

Excision of the ulcer followed by omental patch or primary closure is practiced with small gastric perforations. PGUs larger than 2 cm are considered to be large perforations.[3] Sarath Chandra *et al*. showed large gastric perforations (with the diameter of >3 cm) in most cases to be an indication for resectional surgery while not influencing the outcome.[4] The size of perforation determines the outcome in elderly patients.[5] In our case, the size of perforation required gastric resection.

Table 1: Factors influencing the choice of surgery for perforated gastric ulcer

Pathology-related factors
Pathomorphological factors
Size of perforation
Location of perforated ulcer
Local tissue inflammation
Suspicion of malignancy
Other complications and risk factors of peptic ulcer
Complications
Peritoneal contamination
Presence of sepsis, severe sepsis, or septic shock
Patient-related factors
Age, gender
Comorbidities
Healthcare-related factors
Presence of a qualified surgeon
Presence of facilities

The location of perforated gastric ulcer

Turner *et al*. recommended gastric resection for prepyloric ulcers.[6] However, resectional surgery in current practice is reserved mostly for Johnson Type I and IV ulcers considering higher risk of malignancy.[7] In our case, the PGU is Johnson Type V located on the posterior wall of the antrum. Hence, the location does not require resectional surgery.

Local tissue inflammation

Not having specific surgical treatment recommendations, the site of PGU and the secondary effects on the

surrounding anatomical structures will determine the necessary intervention.[8] This pathomorphologic aspect includes two conditions: Local tissue changes during the index procedure due to ulcer penetration and friable tissues at the index procedure or re-operation due to long-standing diffuse peritoneal contamination. Both conditions are the parts of the other rubric complications. However, this aspect is another viewpoint to them, so that in both conditions, the emerging problem is technical difficulty limiting primary closure. In our case, the ulcer although penetrating the mesocolon did not significantly alter the elasticity of the gastric wall. Hence, the extent of local tissue inflammation allows to perform primary closure.

Suspicion of malignancy

Historically, surgeons were used to consider malignancy in any case of PGU, and nonradical surgery was a concern that a malignant ulcer could be missed. However, several studies showed the frequency of malignant ulcers among all PGUs to be from 3% to 14%.[9,10] In an emergency setting, frozen pathology is mostly unavailable, so a clinicopathological pathway of predicting malignancy including age, ulcer diameter, perforation diameter, symptom duration, and WBC was reported by Ergul and Gozetlik.[11] Such pathologic features as Johnson Type I and IV ulcers,[7] scalloped margins, and loss of rugal folds around ulcer,[12] regional lymph node enlargement are thought to bear a high index of suspicion of malignancy. On the other hand, even if the PGU is a malignant ulcer, noncurative and palliative gastric resections due to diffuse peritonitis should be avoided; instead, two-stage gastric resection (curative R0 resection) following peritonitis recovery and detailed examinations should be performed as it was shown by Hata *et al*.[13] Hence, in cases of PGU treated by primary closure, an important point is ulcer excision.[10] According to the low index of suspicion of malignancy, in our case, primary closure with ulcer excision is better choice.

Other complications and risk factors of peptic ulcer

The combination of PGU with other complications of peptic ulcer is a positive indication of advanced, intractable ulcer disease requiring definitive surgical treatment.[14] In patients with NSAID usage and *Helicobacter pylori* infection, acid-reducing surgery is recommended.[15] In our case, the absence of simultaneous peptic ulcer complication and the presence of NSAID usage do not require resectional surgery.

Pathology-related factors: Complications

Peritoneal contamination and sepsis are also the factors influencing the choice of surgery for PGU significantly. Delays in the treatment of PGU of >12 h result in a 3-fold increase in mortality while delays of 24 h and more are associated with a 9-fold increase in mortality.[16] In all existing scoring systems such as Boey score,[17] Mannheim peritonitis index,[18] and peptic ulcer perforation score,[19] the extent of peritoneal contamination and septic signs such as hypotonia and organ failure is included. In our case, generalized suppurative peritonitis and severe sepsis are present, so primary closure is more appropriate.

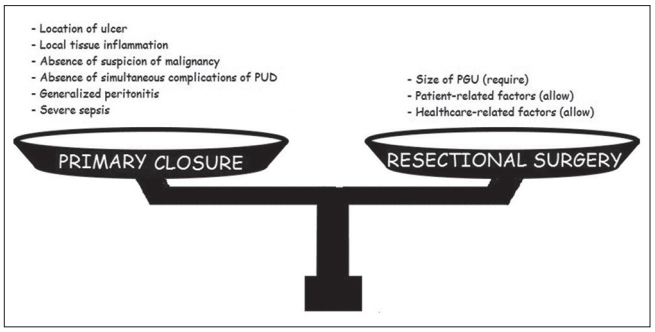

Figure 3: Surgical scales weighing factors influencing surgical strategy for perforated gastric ulcer

Patient-related factors: Age, gender, and comorbidity

Boldly, advanced age is a risk factor increasing morbidity and mortality what was shown in several studies. So *et al*. showed that the age more than 65 was associated with poor outcomes after emergency gastrectomy not depending on underlying disease.[20] Bulut *et al*. showed that the age more than seventy dramatically increases morbidity up to 30%.[21] In the study by Thorsen *et al*., females comprised more than half of the cases, they were older, had more comorbidities and higher Boey risk score.[22] Comorbidities are also an important factor determining the outcome. That is why several scoring systems include comorbidities such as malignancy, AIDS, liver cirrhosis, chronic obstructive pulmonary disease, and chronic steroid use. Patient-related factors in our patient allow to perform gastric resection.

Healthcare-related factors

Healthcare-related factors are also essential so that even if gastrectomy is indicated and even if the patient is fit for major intervention, the absence of an experienced surgeon or facilities to perform a major surgery can emerge to be a serious disturbance. In our case, there were no such disturbances, so gastric resection could be performed.

The surgical scale emerging as a result of the debate is shown in Figure 3.

Conclusion

The decision-making for the choice of surgery for PGU is a multifaceted task requiring consideration of several factors including pathology-related,

patient-related, and healthcare-related factors. Pathology-related factors include pathomorphological factors such as size and location of perforation, local tissue inflammation, suspicion of malignancy, other simultaneous complications and risk factors of peptic ulcer disease, and such complications as peritonitis and sepsis. Patient-related factors include age, gender, and comorbidities, and healthcare-related factors include the presence of facilities and qualified surgeon. Each factor *per se* and their association depicting surgical scales is important in decision-making about the choice of surgical strategy.

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Conflicts of interest

There are no conflicts of interest.

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