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Analysis of Postoperative Complications Following Perforated Duodenal Ulcer and the Impact of Clinical-Surgical Risk Factors

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Annotation: This study analyzes postoperative complications arising after surgical treatment of perforated duodenal ulcers — in particular, dumping syndrome and reflux gastritis — as well as the key clinical and surgical factors influencing their development. It was observed that complications were more frequently encountered in patients over the age of 50, those with large perforation sizes, and in cases where surgery was delayed. Additionally, the presence of underlying somatic diseases significantly increased the likelihood of postoperative complications. Risk assessment systems such as Boey, ASA, and PULP were found to have practical prognostic value in predicting adverse outcomes. The use of laparoscopic techniques, particularly the Graham patch method, was associated with a lower incidence of complications. The findings emphasize that individualized patient management, early detection, and continuous monitoring may contribute significantly to the prevention of postoperative complications.

Keywords: Perforated duodenal ulcer; Dumping syndrome; Reflux gastritis; Graham patch; Risk assessment systems (Boey, ASA, PULP).

Relevance of the Topic. Perforated peptic ulcer is considered one of the most severe and life-threatening conditions in modern emergency abdominal surgery. According to Søreide et al. (2015), this condition is among the most widespread abdominal diseases requiring urgent medical intervention on a global scale. The clinical status of patients can rapidly deteriorate, leading to the development of peritonitis, sepsis, and shock, and with each hour of surgical delay, the risk of death increases [1].

Perforated gastric and duodenal ulcers remain among the most significant pathologies in modern emergency medicine and abdominal surgery. According to Møller et al. (2008), the mortality rate in such cases remains high, especially among elderly patients and those with comorbidities such as cardiovascular, renal, or pulmonary diseases, where mortality can reach up to 25–30% [2].

Surgical treatment of gastric ulcers was one of the standard practices throughout much of the last century, particularly in complicated or recurrent cases. Hamdi and colleagues (1991), in a large series of 419 patients, conducted a comprehensive analysis of long-term postoperative outcomes in this field. The study mainly included patients who underwent resection techniques, focusing on postoperative remission, functional status, symptomatic recurrence, complications (e.g., dumping syndrome, reflux gastritis, weight loss), as well as overall quality of life indicators.

Hamdi and his team noted that, despite positive initial clinical results, many patients developed significant long-term functional and metabolic complications. Specifically, even in the presence of initial surgical success, prolonged discomfort, weight loss, and digestive issues were frequently observed. One of the key conclusions of the study was that the decision for surgery should consider not only the ulcer itself but also the patient's overall health condition, lifestyle, and long-term prognosis.

While the efficacy of surgery can be high when performed appropriately, postoperative functional outcomes are not always ideal [3].

Perforation of the duodenal ulcer is a serious abdominal pathology requiring emergency surgical intervention, with mortality and morbidity influenced by numerous factors. In their pivotal study, Boey, Vong, and Ong (1982) focused specifically on identifying prognostic factors that could help predict surgical risk in such cases. Their work laid the clinical foundation for what is now widely used in practice as the Boey risk score system.

The study aimed to create a simple, accurate, and clinically applicable risk assessment model by analyzing preoperative and intraoperative clinical parameters. The authors examined over 100 patients with perforated ulcers and identified the following three key risk factors associated with increased mortality:

Presentation in shock;

Delayed surgery (>24 hours after the onset of abdominal pain);

Presence of a serious underlying medical illness.

Based on these parameters, the Boey scoring system was developed: each risk factor is assigned 1 point, and the total score is used to predict the risk of postoperative mortality. For example, 0 points = low risk, 1–2 points = moderate risk, and 3 points = high risk. The work by Boey and colleagues continues to serve as a practical guideline in surgical decision-making, helping to expedite emergency interventions and improve prognostic accuracy [4].

Lam et al. (2006) in their article presented the experience of closing perforated ulcers using the "three-stitch" Graham patch technique via a laparoscopic approach. In this approach, a small perforated point is sutured using three U-shaped seromuscular stitches, and an omental (epiploic) patch (Graham patch) is applied over it. This technique, due to its simplicity and speed, offers advantages over traditional open surgeries.

The authors emphasized that the laparoscopic approach ensures:

- Better peritoneal cleaning from blood and exudate,
- Less postoperative pain,
- Faster postoperative recovery,
- Shorter hospital stay duration.

In the laparoscopic Graham patch technique, the "three-stitch" scheme is both technically simple and safe, and has demonstrated high effectiveness in closing perforated ulcers. Moreover, in selected patients, this method can be performed without major complications. This study suggests that laparoscopic surgery, especially in emergency conditions like PPU, may become the standard technique in the future due to not only cosmetic advantages but also its clinical effectiveness [5].

Arici et al. (2007) conducted a study focused on the clinical analysis of factors increasing morbidity and mortality in the treatment of perforated ulcers.

The authors examined 100 patients who underwent surgery for perforated ulcers and identified the following risk factors as statistically significant:

- Delayed surgery (over 24 hours),
- Pre-existing cardiac, diabetic, or respiratory diseases,
- Advanced age (over 60 years),
- Presentation in shock,
- Renal failure and metabolic acidosis.

The analyses carried out in this study showed that these factors significantly increase the risk of mortality and complications in patients undergoing surgery for perforated ulcers. Therefore, each patient's condition must be individually assessed preoperatively, and the risk level should be calculated using clinical scoring systems. Arici et al. recommended determining prognosis based on Boey and other scoring systems and emphasized that rapid intervention could reduce mortality rates [6].

The above-mentioned scientific sources and clinical observations indicate that perforated peptic ulcer is a complex pathology requiring prompt diagnosis, accurate prognosis, and effective surgical intervention. The choice of surgical technique, assessment of the patient's condition, and approaches aimed at preventing complications play a crucial role in addressing this issue.

Materials and Methods: This study was conducted based on patients who underwent emergency surgery for perforated duodenal ulcer at the Department of Abdominal Surgery of the Namangan Branch of the Republican Scientific Center for Emergency Medical Care between January 2022 and December 2024. A total of 65 patients were included in the study, comprising 42 females and 23 males, with an age range of 22 to 74 years. In all patients, the ulcer site was closed using the Graham patch technique, consisting of three U-shaped seromuscular sutures and omental patching. The operations were performed via laparotomy approach.

All patients were followed up for a minimum of 12 months after surgery. During the follow-up, patients were evaluated for subjective complaints, changes in digestion, pain, weight loss, and discomfort related to cardiovascular and gastrointestinal systems. After one year, the patients were recalled for re-examination, which included both clinical assessment and endoscopic examination (FGDS).

Among these patients:

- 18 patients (27.7%) developed postoperative complications,
  - 10 patients showed signs of dumping syndrome,
  - 8 patients were diagnosed with reflux gastritis.

To assess risk factors influencing the likelihood of postoperative complications, the following clinical and demographic indicators were analyzed:

- Age groups (≤50 years and >50 years),
- Delay before surgery (≤24 hours and >24 hours),
- Comorbidities (hypertension, diabetes mellitus, COPD),
- Admission in a state of shock,
- Diameter of perforation,
- Severity of peritonitis,
- Type and duration of surgery.

Statistical analysis was performed using SPSS version 25.0. Multivariate correlation analysis and Pearson's χ^2-test were applied. Associations between the main complications and risk factors were considered statistically significant at $p<0.05$.

Results. Among the 65 patients included in the study, postoperative complications were observed in 18 patients (27.7%). The main identified complications were dumping syndrome in 10 cases (15.4%) and reflux gastritis in 8 cases (12.3%). The incidence of complications was higher among patients older than 50 years—38.5% (13/34)—compared to 16.1% (5/31) in those aged 50 years or younger ($p = 0.028$). Among patients operated within 24 hours, complications occurred in 18.9% (7/37), whereas among those operated after 24 hours, the rate increased to 39.3% (11/28) ($p = 0.041$). When the perforation size was ≤0.5 cm, complications were noted in 13.3% (4/30); with a size ≥0.6 cm, the complication rate rose to 40% (14/35) ($p = 0.016$).

Among 25 patients with comorbid conditions, 11 (44%) developed complications, compared to 7 (17.5%) out of 40 patients with no comorbidities ($p = 0.012$).

In patients with dumping syndrome, early-phase symptoms such as palpitations, sweating, dizziness, and hypotension were observed within 30–45 minutes after meals. These patients responded well to dietary modifications, rehabilitation, and metabolic therapy.

In patients diagnosed with reflux gastritis, endoscopic (EGD) examination revealed biliary reflux, antral erosions, and mucosal hyperemia. Proton pump inhibitors and antacids were prescribed, resulting in symptom relief.

According to Pearson's χ^2 test and logistic regression analysis, the following factors were confirmed as significant independent risk factors for postoperative complications: age over 50 years (OR = 2.8; 95% CI: 1.2–6.9), delayed surgery (beyond 24 hours) (OR = 2.4; 95% CI: 1.1–5.3), larger perforation size (≥0.6 cm) (OR = 3.1; 95% CI: 1.4–7.0), presence of comorbidities (OR = 2.6; 95% CI: 1.3–6.1).

Discussion. The results of this study demonstrate that postoperative complications following surgery for perforated duodenal ulcers are significantly associated with certain clinical and surgical risk factors. Among the identified complications, the predominance of dumping syndrome and reflux gastritis indicates impaired motor and evacuatory function of the gastrointestinal tract in such pathologies. Dumping syndrome was particularly observed more frequently in older patients and those who underwent delayed surgery. This condition may be attributed to physiological changes related to increased gastric pressure and autonomic nervous system reactions.

Additionally, cases of reflux gastritis were confirmed via gastroscopic examination, showing signs of biliary reflux and enhanced acid aggression, which supports the clinical suspicion. Major statistical analyses identified age over 50 years, delayed surgical intervention, larger perforation size, and the presence of comorbid somatic diseases as independent risk factors for the development of postoperative complications. These factors play a critical role in assessing patients and predicting potential outcomes.

In recent years, the Graham patch technique and its modified laparoscopic approaches have been widely applied as minimally invasive and effective methods for sealing perforations. However, delayed surgery and the presence of comorbid conditions significantly increase the likelihood of complications during the treatment process. Comparative data from other studies (Masood et al., 2021; Kim et al., 2020) also highlight a higher incidence of complications in older patients and those operated on after delays.

In such scenarios, early diagnosis, high clinical vigilance, and regular evaluation using risk assessment tools like the Boey score, ASA classification, and PULP score may help reduce complication rates. Overall, the findings suggest that in the surgical treatment of perforated duodenal ulcers, careful consideration of patient age, perforation size, timing of surgery, and underlying comorbidities is crucial. Developing an individualized treatment approach based on these factors can significantly help mitigate the risk of postoperative complications.

Conclusion. Based on the findings of this study, the main postoperative complications following perforated duodenal ulcer surgery—dumping syndrome and reflux gastritis—were found to be associated with various risk factors. An individualized assessment for each patient, timely surgical intervention, and a preference for laparoscopic techniques can help reduce the development of complications. Additionally, the use of risk assessment scoring systems plays a crucial role in selecting the appropriate surgical strategy.

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