Immediate Results of Minimally Invasive Surgery for Complicated Peptic Ulcers of the Stomach and Duodenum

Objective: To enhance the immediate treatment outcomes of complicated peptic ulcers of the stomach and duodenum through the development and application of video-assisted organ-preserving surgeries. Materials and Methods: This study analyzed the treatment outcomes of 261 patients with complicated gastric and duodenal ulcers. The patients received the treatment in the surgical departments of Azerbaijan State Advanced Training Institute for Doctors named after A. Aliyev, Scientific Surgical Center named after M.A. Topchubashev, and Sabunchi Medical Center from 2015 to 2023. All patients with perforated and bleeding ulcers of the stomach and duodenum underwent clinical and instrumental examinations. The initial general condition of the patient was thoroughly assessed. Among the patients, there were 220 men (84.3%) and 41 women (15.7%), with ages ranging from 18 to 84 years. There were 75 (28.7%) patients complicated with bleeding of gastric and duodenal ulcer, and 186 (71.3%) patients with perforation. In the control group, traditional, "open" surgical interventions were performed in 164 (62.8%) patients, and minimally invasive endoscopic video-assisted operations were performed in 97 (37.2%) cases. Out of 186 patients, 124 (66.7%) underwent traditional suturing of a perforated gastroduodenal ulcer during laparotomy, while 62 (33.3%) underwent minimally invasive endosurgical interventions. In the control group, 12 (8.4%) patients underwent gastric resection, and 10 (5.4%) underwent vagotomy with pyloroplasty. The immediate results of radical operations for a perforated ulcer were characterized by a high percentage of early complications, with 5 (41.6%) cases. Results. Of the 186 patients operated on for perforated gastroduodenal ulcer, 12 individuals (6.5±2.9%) developed complications in the postoperative period: 9 (7.3%) in the comparison group, and 3 (4.8%) patients in the main group. We obtained a statistically significant shorter duration of a surgical intervention by 24.8 minutes and shorter hospital staying time due to a decrease in the duration of the postoperative period by 5.3 days, a lower number of postoperative complications by 2.5%, and a lower postoperative mortality by 2.4%. The duration of laparoscopic suturing of a perforated ulcer averaged 38.6 minutes. The duration of hospital staying averaged 6.9±1.2 days. The use of minimally invasive interventions for ulcerative duodenal bleeding was accompanied by a significant reduction in the rehabilitation period compared with that after traditional, "open" operations that amounted to 18.3±3.6 and 35.5±5.9 days, respectively. Postoperative mortality was 1.3% (1 patient in the control group died). Conclusion. The outcome of treatment depends on the age of patients, the timing of the onset of the disease, the severity of concomitant pathology, the severity and extent of peritonitis and the duration of ulcerative anamnesis.

Key words: perforated gastroduodenal ulcer, suturing of a perforated ulcer from a mini-access, videolaparoscopy, vagotomy, immediate results.

Peptic ulcer of the stomach and duodenum is one of the most common diseases in gastroenterology. According to many authors, the incidence of peptic ulcer of the stomach and duodenum is on average 5.1-5.7 per 1000 people [1, 2, 3]. At the same time, the last decades have been characterized by a statistically significant increase in morbidity [4, 5, 6, 7, 8]. Quite often, the course of peptic ulcer of the stomach and duodenum is accompanied by such complications as penetration, perforation, bleeding, stenosis. Numerous national and foreign authors indicate an increase in the frequency of complicated course of gastric and duodenal ulcer up to 9 - 18%. Duodenal ulcer perforation occurs in 5-7%, duodenal ulcer penetration is observed in 10 - 15% of patients suffering from peptic ulcer, cicatricial stenosis occurs in 5 - 15%, bleeding from duodenal ulcer is found in 15 - 20% of cases [9, 10, 11, 12]. These complications remain one of the most difficult problems in modern surgery. Uncomplicated peptic ulcer of the stomach and duodenum in practical medicine is amenable to conservative treatment under the action of anti-ulcer drugs [1, 2, 3, 8]. Complicated forms of peptic ulcer of the stomach and duodenum often require surgical intervention. Organ-preserving operations are widely used in the surgery of complicated peptic ulcer disease, including various variants of vagotomy with gastric drainage surgery [4, 9]. The introduction of endoscopic video-assisted surgery has opened up new approaches in the treatment of complicated duodenal ulcer. Due to the wide technical capabilities of endosurgery, a video laparoscopic operation consisting of laparoscopic vagotomy and pyloroplasty through a minimal access, with the radicality of a conventional operation, compares favorably with its minimally invasive counterparts [13, 14]. However, the immediate results of minimally invasive endosurgical interventions in patients with complicated peptic ulcer of the stomach and duodenum in comparison with traditional methods of surgical treatment have not been widely reported in the literature.

The objective of this study is to improve the immediate results of the treatment of complicated peptic ulcer of the stomach and duodenum through
depends on the development and application of video-assisted organ-preserving operations.

Material and methods

This study analyzed the treatment outcomes of 261 patients with complicated gastric and duodenal ulcers. The patients received the treatment in the surgical departments of Azerbaijan State Advanced Training Institute for Doctors named after A. Aliyev, Scientific Surgical Center named after M.A. Topchubashev, and Sabunchi Medical Center from 2015 to 2023. All patients with perforated and bleeding ulcers of the stomach and duodenum underwent clinical and instrumental examinations. The initial general condition of the patient, body type, position of the patient on the gurney, the presence or absence of signs of blood loss, shock and intoxication were carefully studied. Before the operation, the following parameters were subjected to comparative analysis: age, sex, rating by the Boye scale, rating by the scale of the American Society of Anesthesiologists (ASA). Intraoperative characteristics include severity of peritonitis in points according to the Mannheim peritoneal index (MPI), morphology of the zone and diameter of the perforation, operation option, duration of intervention, frequency of surgical access conversions, intraoperative complications. After surgery, the following parameters were analyzed: the frequency and structure of postoperative complications, postoperative mortality, severity of postoperative pain syndrome, duration of hospitalization. There were 220 men (84.3%), 41 women (15.7%). The age of the patients ranged from 18 to 84 years, the average age was 38.1 years.

Out of 261 patients with complicated bleeding of gastric and duodenal ulcers, there were 75 (28.7%) cases of bleeding and 186 (71.3%) cases of perforation. Traditional "open" surgical interventions were performed in 164 (62.8%) patients, while minimally invasive endovideosurgical operations were performed in 97 (37.2%) cases. Among the 75 patients with ulcerative bleeding, 40 (53.3%) underwent traditional laparotomy surgery, and 35 (46.7%) underwent minimally invasive video-assisted laparoscopic surgery. The study included data on 186 patients with gastric and duodenal ulcers complicated by ulcer perforation. All patients underwent emergency surgery within the first eight hours from the onset of the disease, i.e., before the development of diffuse peritonitis. Of these, 124 (66.7%) patients underwent traditional laparotomy operations, while 62 (33.3%) underwent minimally invasive endosurgical interventions.

Statistical data processing was carried out on a personal computer based on a Pentium 2160 MHz processor using Excel and Access computer programs Microsoft Office 2003 SP2 System Professional and Statistica 10.0. To characterize the aggregate, the average values (M), the mean square deviation (SD), the error of the arithmetic mean (m) were calculated. Categorical data were presented as an absolute number and relative frequencies in %. The analysis of the normality of the distribution of the studied indicators was calculated using the Shapiro-Wilk test. To compare the quantitative indicators of independent samples with a normal distribution of variables, the Student’s parametric criterion (t-test) was used, the differences between the groups were considered statistically significant at p<0.05 (p is the probability level of a possible error).

In conducting an intergroup comparative analysis of postoperative complications and mortality, the Fisher angular transformation technique, the z-criterion, was used. To compare the qualitative indicators of the two samples, regardless of the type of distribution, the χ2 criterion was used, if necessary, the Yates correction or the exact Fisher criterion were applied. To express the result of the intervention and the magnitude of the effect, the method of conjugate tables was used (Vlasov V.V., 2000) and the criteria provided for by evidence-based medicine were applied.

Results

We evaluated the immediate results of treatment by the frequency of postoperative complications, the duration of the postoperative staying at the hospital, the results of the study of gastric secretion in the postoperative period, motility and evacuation, as well as esophagogastroduodenoscopy data.

Immediate results of mini-invasive suturing techniques for perforated gastroduodenal ulcers

During the immediate postoperative period, patients who underwent traditional and minimally invasive surgical interventions were characterized by the following features:

The duration of suturing of a perforated gastroduodenal ulcer (PGDU) ranged from 30 to 160 minutes, the average duration of surgery in the main group was 46.2±6.8 minutes, in the comparison group, it lasted 71.0±8.2 minutes. In the study of pain syndrome during the first day following surgery according to the Wong-Baker scale, the daily score was from 2 to 7, on average it was 4.2 ± 0.5 scores. Body temperature returned to normal in patients in the comparison group within 1 – 7 days, on average after 3.9 ± 0.2 days, while in patients of the main group, it returned within 1 – 6 days, on average after 3.5 ± 0.6 days. The length of hospital stay in patients of the control group ranged from 6 to 14 days, with an average of 12.2 ± 1.0 bed days. The length of hospital stay in patients of the main group ranged from 6 to 12 bed days, with an average of 6.8 ± 1.2 days.

The duration of the operation initially ranged from 80 to 110 minutes in a combined approach, but as experience was gained, it decreased to 40-60 minutes. The average duration of combined suturing of a perforated gastroduodenal ulcer through a mini-access was 45-50 minutes. Among the 26 patients who underwent suturing of a perforated gastroduodenal ulcer through a mini-access, the
following difficulties were encountered during the transition to the therapeutic stage of laparoscopic intervention: in 2 (7.7%) patients, the location of the ulcer was difficult to get access for laparoscopic suturing, particularly due to its close proximity to the small curvature of the stomach; in 3 (11.5%) patients, the diameter of the ulcer exceeded 8-10 mm. In 5 (19.2%) patients, there was dense infiltration in the perforation area, with a hole diameter exceeding 0.8 cm, requiring wide stitches with partial immersion of the infiltrate, which was not feasible laparoscopically. 8 (30.8%) patients had pronounced infiltration of the inflamed edges of the perforated ulcer. Attempts at laparoscopic suturing resulted in sutures breaking, raising concerns about the tightness of the closure. Consequently, we opted to switch to suturing through minimal access. In 2 (7.7%) patients, diagnostic laparoscopy revealed significant visceroparietal adhesions, making the pyloroduodenal zone either inaccessible or difficult to sanitize. In these cases, suturing of a perforated gastroduodenal ulcer through a minimal access was also successfully performed.

When assessing the pain syndrome using the Wong-Baker scale, patients who underwent suturing of a perforated gastroduodenal ulcer (PGDU) through a minimal access reported a daily score ranging from 3 to 8, with an average of 6.2±0.7 points. The time for body temperature normalization in the postoperative period varied from 1 to 8 days, with an average of 3.6 ± 0.6 days for patients who underwent suturing through a minimal access and 3.4 ± 0.6 days for those who underwent laparoscopic suturing. Hospital stay duration for patients in the main group who underwent suturing of a perforated gastroduodenal ulcer from a mini-access ranged from 4 to 11 days, averaging 6.7± 0.5 bed days.

The length of stay in the hospital for patients with MG who underwent laparoscopic suturing of a perforated gastroduodenal ulcer varied from 4 to 11 days, on average 6.6± 0.5 bed days. Bed rest was typically discontinued for patients in both the main and control groups after 1-2 days, although most patients got up the day after surgery. Anesthesia with narcotic analgesics was administered on average twice a day for the first postoperative day in both comparison groups.

Three (11.5%) patients who underwent suturing of a perforated gastroduodenal ulcer from a mini-access, developed intestinal paresis, which lasted on average about 2 days; in this group of patients there was also a large discharge from the nasogastric probe. The phenomena of paresis were stopped, as a rule, on the 3rd day. In other patients, peristalsis restored 6-12 hours following the surgery. Sutures were removed in patients of the control and main groups on 5-6 days after surgery. In two cases, patients in the main group underwent relaparotomy. In one case, on the 3rd day after suturing a perforated duodenal ulcer according to Oppel-Polikarpov, the failure of the sutured ulcer occurred. After preoperative preparation, the patient underwent a relaparotomy, gastric resection according to Billrot II.

In another case, on the 3rd day after suturing a perforated duodenal ulcer, the patient developed a clinical picture of early adhesive intestinal obstruction. The patient also underwent a relaparotomy, dissection of abdominal adhesions.

In the immediate postoperative period, complications developed in 3 (4.8%) cases in patients who underwent suturing of a perforated gastroduodenal ulcer from a mini-access. The failure of the sutured ulcer developed in 2 (7.7%) cases in patients who underwent ulcer suturing through a mini-access, in 1 (2.8%) cases among the patients who underwent laparoscopic suturing of a perforated gastroduodenal ulcer. Two (7.7%) patients who had a perforated gastroduodenal ulcer sutured from a mini-access, underwent relaparotomy and gastric resection according to Billrot II; 1 (2.8%) patient underwent laparoscopic suturing of a perforated gastroduodenal ulcer, relaparotomy, excision of the ulcer, bilateral stem subdiaphragmatic vagotomy, and pyloroplasty by Finney.

Immediate results of gastric resection in the treatment of patients with perforated gastroduodenal ulcers

A notable feature of modern perforated gastroduodenal ulcers is the high incidence of other complications of peptic ulcer disease combined with perforation (such as bleeding, malignancy, "mirror" ulcers), and repeated perforations, collectively reaching 40-50%. In the presence of these combined complications, standard suturing of the perforation is often impossible. The palliative treatment for perforated ulcer has its drawbacks, including a high recurrence rate of peptic ulcer disease, the potential for repeated perforations, and the risk of stenosis in the stomach and duodenal outlet. These factors significantly limit the indications and feasibility of performing organ-preserving operations in such cases. Gastric resection is often the only reasonable and radical operation in such situations.

However, sometimes the performance of gastric resection was limited by the lack of necessary conditions for its implementation (preparedness of the surgical team, widespread purulent peritonitis). The main goal of all radical operations for perforated gastroduodenal ulcer is the elimination of aggressive acid-peptic factor, ensuring adequate evacuation function of the stomach. In the comparison group, 8 (5.6%) patients underwent gastric resection according to Billroth-II, 4 (2.8%) patients underwent gastric resection according to Billroth-I. The rarity of performing this modification (according to Billroth-I) of gastric resection is explained by the presence of pronounced inflammatory infiltration in the area of the pyloroduodenal junction, and when it is technically impossible to perform this operation. Gastric resection according to Billroth-II in the modification of the Hofmeister-Finsterer was performed in 8 (5.6%) patients (Table 1).
However, there were instances where performing gastric resection was limited due to the lack of necessary conditions, such as preparedness of the surgical team or widespread purulent peritonitis. The primary objective of all radical operations for perforated gastroduodenal ulcers is to eliminate the aggressive acid-peptic factor and ensure adequate gastric evacuation function. In the comparison group, 8 (5.6%) patients underwent gastric resection according to Billroth-II, while 4 (2.8%) patients underwent gastric resection according to Billroth-I. The infrequency of performing Billroth-I gastric resection is attributed to pronounced inflammatory infiltration in the area of the pyloroduodenal junction, making it technically challenging to perform. Gastric resection according to Billroth-II in the modification of Hofmeister-Finsterer was performed in 8 (5.6%) patients (see Table 1).

<table>
<thead>
<tr>
<th>Operation</th>
<th>Localization of the ulcer</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gastric resection according to Billroth-I</td>
<td>stomach: 3, duodenum: 1</td>
<td>4</td>
</tr>
<tr>
<td>Gastric resection according to Billroth-II</td>
<td>stomach: 3, duodenum: 5</td>
<td>8</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>12</td>
</tr>
</tbody>
</table>

Table 1. Types of radical surgical interventions for perforated gastroduodenal ulcer

Discussion

Analyzing the results of treatment of patients with perforated gastroduodenal ulcer who underwent gastric resection (GR), we came to the conclusion that the treatment outcomes depended on the age of the patients, the timing of the onset of the disease, the severity of concomitant pathology, and the duration of the ulcerative anamnesis, as well as the qualification of the surgical team. The greatest number of complications was observed following the gastric resection according to Billroth II-4 (33.3%). In general, complications developed after gastric resection in 5 (41.7%) of 12 patients. Abdominal abscess was observed in 2 (16.7%) patients: based on the localization, one patient had an abscess located in the subhepatic space, the other was found in the left subdiaphragmatic space. Both patients underwent puncture and drainage of the abcess, followed by irrigation. Both patients were discharged upon clinical recovery. Partial suppuration was observed in one (8.3%) patient. Surgeons drained the abscess and began daily wound dressings with antiseptic solutions to promote healing. One patient (8.3%) developed postoperative pancreatitis, and one patient (8.3%) developed thromboembolism. In this case, pulmonary embolism (PE) occurred in large branches of atrial fibrillation, leading to sudden death on the 7th day after the operation. Mortality in this group of patients was 1 (8.3%) case (see Table 2).

<table>
<thead>
<tr>
<th>The nature of postoperative complications</th>
<th>Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abdominal abscess</td>
<td>GR by Billroth-I: 1 (8.3%), GR by Billroth-II: 2 (16.7%)</td>
</tr>
<tr>
<td>Wound suppuration</td>
<td>GR by Billroth-I: 1 (8.3%), GR by Billroth-II: 1 (8.3%)</td>
</tr>
<tr>
<td>Postoperative pancreatitis</td>
<td></td>
</tr>
<tr>
<td>PE</td>
<td>GR by Billroth-I: 1 (8.3%), GR by Billroth-II: 4 (33.3%)</td>
</tr>
<tr>
<td>Total</td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Postoperative complications depending on the type of resection

The immediate results of radical operations for a perforated ulcer were characterized by a high percentage of early complications-5 (41.6%). The highest percentage of complications was in patients who underwent gastric resection according to Billroth II.

Immediate results of organ-preserving operations with vagotomy in patients with perforated gastroduodenal ulcers

Vagotomy and pyloroplasty were performed in the treatment of patients with perforated gastroduodenal ulcers in 10 (5.4%) cases. These included: selective vagotomy with pyloroplasty according to Finney in 1 (10.0%) case, pyloroplasty according to Heineke-Mikulicz in 1 (10.0%) case, and stem vagotomy with pyloroduodenal anastomosis according to Jabuley in 1 (10.0%) case.

Upon analyzing the treatment outcomes in patients with perforated gastroduodenal ulcers who underwent organ-preserving surgery with various types of pyloroplasty, we concluded that outcomes were dependent on several factors including patient age, disease onset time, severity of comorbidities, extent of peritonitis, and duration of ulcerative anamnesis. Complications developed in 4 (40.0%) of the total operated patients. One (10.0%) patient developed an abdominal abscess located in the left subdiaphragmatic space, which was successfully punctured and drained under ultrasound control. The patient was discharged with clinical recovery. Three (30.0%) patients experienced wound suppuration postoperatively, with no fatalities observed in this group.

Out of 186 patients operated on for perforated gastroduodenal ulcer, 12 (6.5±2.9%) developed complications in the postoperative period: 9 (7.3%) in the comparison group and 3 (4.8%) in the main group (p<0.05). The mortality rate in the compar-
son group among operated patients (124 patients) was 3 (2.4%) cases, while no mortality was observed in the main group (p>0.05).

The choice of surgical intervention for perforated gastroduodenal ulcers was determined, in some cases, after rapid diagnosis of biopsy material from the ulcer. For chronic ulcer perforations, radical surgical interventions or excision of the ulcer with pyloroplasty and vagotomy were preferred. For acute ulcer perforations, simple suturing of the ulcer from a mini-access was employed, followed by eradication therapy.

The main diagnostic technique applied was abdominal X-ray. Free gas in the abdominal cavity was detected in 77.4% of cases, the sensitivity of this examination method was 77.4%. Abdominal ultrasound and esophagastroduodenoscopy also successfully complemented each other. Abdominal ultrasound was used to determine the degree of prevalence of peritonitis, the presence or absence of signs of intestinal paresis. The sensitivity of this method was 74.3%.

In cases where there was a clinical suspicion of a perforated gastroduodenal ulcer but no free gas in the abdominal cavity was detected, esophagastroduodenoscopy was added to the diagnostic program. This allowed visualization of the ulcer and any combined complications, as well as determination of its location. Histological confirmation of perforation of a chronic gastric or duodenal ulcer led to a preference for either gastric resection or excision of the ulcer with pyloroplasty and vagotomy, depending on its location. Following diagnostic laparoscopy, the final decision regarding the method of suturing a perforated gastroduodenal ulcer was made. If transitioning to therapeutic laparoscopic intervention was not possible, suturing the ulcer from a mini-access using the "Mini-Assistant" kit was preferred. This approach helped avoid numerous conversions when laparoscopic suturing was not feasible. Reasons for switching to the combined method of ulcer suturing included the ulcer's inconvenient location, significant infiltration in the surgical area, adhesions in the epigastrium, and the need for palpation to evaluate the ulcer. Suturing an ulcer from a mini-access serves as a valuable alternative to laparoscopic techniques, offering the benefits of minimally invasive interventions without sacrificing efficacy.

Thus, the analysis of the immediate findings of laparoscopic interventions revealed the advantages of minimally invasive operations in comparison with traditional interventions (Table 3). We obtained a statistically significantly shorter duration of surgery by 24.8 minutes (p<0.001), shorter hospitalization stay due to a decrease in the duration of the postoperative period by 5.3 days (p<0.001), fewer postoperative complications by 2.5% (p<0.05), and lower postoperative mortality by 2.4% (p<0.05). The duration of laparoscopic suturing of a perforated ulcer averaged 38.6 minutes. The duration of hospitalization averaged 6.9±1.2 days.

<table>
<thead>
<tr>
<th>Indicators</th>
<th>Group</th>
<th>Comparative Group</th>
<th>Δ</th>
<th>Significance level (p)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration of the operation, min. (M±SD)</td>
<td>46.2±6.8</td>
<td>71.0±8.2</td>
<td>24.8</td>
<td>p&lt;0.001</td>
</tr>
<tr>
<td>Duration of the postoperative period, day (M±SD)</td>
<td>6.9±1.2</td>
<td>12.2±1.0</td>
<td>5.3</td>
<td>p&lt;0.001</td>
</tr>
<tr>
<td>The frequency of postoperative complications, %</td>
<td>4.8% (n=3)</td>
<td>7.3% (n=9)</td>
<td>2.5%</td>
<td>(p&lt;0.05)</td>
</tr>
<tr>
<td>Lethality, %</td>
<td>-</td>
<td>2.4% (n=3)</td>
<td>2.4%</td>
<td>(p&lt;0.05)</td>
</tr>
</tbody>
</table>

Table 3. Comparative analysis of the results of minimally invasive (main group) and laparotomic methods (comparison group) of PGDU suturing

<table>
<thead>
<tr>
<th>Postoperative complication</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>present</td>
<td>no complication</td>
</tr>
<tr>
<td>Main</td>
<td>3 (A)</td>
</tr>
<tr>
<td>Comparison</td>
<td>9 (C)</td>
</tr>
</tbody>
</table>

Table 4. Assessment of the correlation of relative effectiveness indicators of interventions in the study groups

It should be noted that according to the surgical status, the patients of the main group felt satisfactory and were ready to be discharged 6-7 days after surgery. However, the duration of hospitalization was due to the need for etiotropic therapy of peptic ulcer disease, as well as directed by modern standards of patient management. From the first day of treatment, antisecretory and antihelicobacteria drugs were prescribed.

During the analysis of the results of the study, we noted a significantly lower number of postoperative complications in the group of patients who underwent minimally invasive intervention in the main group — 4.8% versus 7.3% in the comparison group. This indicator was achieved largely due to the reduction of wound complications that occur after operations performed against the background of purulent peritonitis.

The absence of a wide laparotomy has a positive effect on the dynamics of the immediate postoperative period. Patients note a lower severity of pain syndrome, which contributes to early activation of the patient and reduces the likelihood of respiratory complications. Most of the patients got up and moved around the ward by the end of the first day. To express the result of the intervention and the magnitude of the effect, the method of conjugate
tables was used (Vlasov V.V., 2000) and the criteria provided for by evidence-based medicine were applied (Table 4).

Comparing two types of treatment in the main and comparison groups, we assessed the probability (risk) of adverse outcomes or complications. For this purpose, the relative risk (RR) and its 95% confidence interval (95%CI) were calculated:

\[ RR = \frac{A}{A+B}/\left(\frac{C}{C+D}\right) \]

\[ RR = \frac{3/62}{9/124} = 0.66 [95\% CI(1)] \]

R1 – the risk of an adverse outcome after surgery in the main group:

R2 = C/(C+D) = 0.073 or 7.3%.

ARR – absolute reduction of the risk of an adverse outcome:

ARR = R1-R2 = 4.8% - 7.3% = 2.5%.

As can be seen from the calculations presented, the introduction of minimally invasive techniques leads to a 2.5% reduction in the risk of postoperative complications in the main group compared with the control group.

To determine the prospects of the developed treatment method, we determined the indicator number of patients (NP), which translates relative values into the number of patients who need to be treated with the proposed method in order to prevent one adverse outcome. Emergency – the number of patients who need to be treated to prevent one adverse outcome was:

NP = 1 / A/(A+B) – C/(C+D) = 1 / (0.048-0.073) = 4.00 (5)

Thus, the study of the data of the preoperative examination of patients with PGDU, as well as the analysis of the immediate results of various options for surgical treatment of PGDU, allowed us to establish the leading criteria influencing the choice of a rational surgical intervention option:

- the diameter of the perforated ulcer and the presence and width of the infiltrative ulcerative lesion around the perforation;
- the degree of surgical and anesthetic risk according to the ASA scale;
- the nature and prevalence of peritonitis (MPI indicator);
- predicted mortality on the J. Boey scale.

The data obtained by us indicate that surgical treatment of patients with PGDU should be differentiated in a specialized hospital. When forming indications for choosing an option for surgical intervention, it is advisable to establish criteria after an adequate assessment of the general somatic status of the patient and changes in the location of the perforated ulcer. Treatment for gastroduodenal ulcerative bleeding using traditional, "open" surgical interventions was performed in 40 (53.3%) patients out of 75. At the same time, 25 (62.5%) patients underwent gastric resection according to Billroth-II, 2 (5.0%) patients underwent gastric resection according to Billroth-I, gastrotomy, excision of ulcers, stitching of bleeding vessels -1 (2.5%). Organ-preserving operations with vagotomy were performed in 12 (30.0%) patients, while minimally invasive surgical interventions were carried out in 35 (46.7%) patients. Among the minimally invasive procedures, laparoscopic stem vagotomy (LSV) combined with excision of the ulcer via mini-access and pyloroplasty by the Geinek-Mikulich method was performed in 7 patients, LSV combined with excision of the ulcer via mini-access and pyloroplasty by the Finney method in 3 patients, LSV combined with excision of the ulcer via mini-access and pyloroplasty by the Cabuley method in 3 patients, and LSV combined with extraduodenation of the ulcer and pyloroplasty through mini-access in 5 patients. Laparoscopic distal resection according to B-II was performed in 4 patients.

The duration of the operation in the main group was 125.4±15.6 minutes, compared to 98.6±9.7 minutes in the comparison group. The length of hospital stay in the control group ranged from 6 to 14 days, with an average of 19.7±3.8 days. In contrast, the length of hospital stay in the main group ranged from 6 to 12 days, with an average of 12.5±2.6 days. During the use of standard surgical interventions, the following intraoperative complications were noted.

Compression of the hematoma with a tampon for 10 minutes stabilized it and did not interfere with the continuation of the operation. In the immediate postoperative period, one patient (2.8%) who underwent minimally invasive surgery developed hematomas in the trocar area in the paraumbilical region, leading to subsequent suppuration (1.3%). The wound was irrigated, and local treatment was administered according to the general principles of managing purulent wounds, resulting in recovery. One patient (2.8%) developed postoperative pneumonia. In two cases (5.7%), patients experienced postvagotomy gastroparesis, which was resolved with conservative measures. During follow-up, one patient (2.8%) experienced recurrent bleeding after extraduodenation of the ulcer on the posterior wall of the duodenum and stem vagotomy. Suture dehiscence and postoperative peritonitis occurred in one patient (2.8%). No other postoperative complications were observed.

It is worth noting that patients who underwent minimally invasive endosurgical methods showed a significant reduction in acid formation during the immediate postoperative period, with levels reaching 58.7±5.6% in the basal phase and 51.1±4.9% in the stimulated phase.

Patients who underwent traditional surgical in-
Interventions exhibited the following features during the immediate postoperative period: suppuration and seromas of the postoperative wound developed in 3 (7.5%) patients, and postoperative pneumonia was diagnosed in 1 (2.5%) case. The source of recurrent bleeding was identified as the area of pyloroplasty on the anterior wall of the pyloroduodenal zone. One patient (2.5%) experienced suture failure and postoperative perforitons, while two (5.0%) patients developed postvagotomy gastraprosis out of 40. Acute cardiovascular and organ failure, reflecting pronounced concomitant coronary pathology, complicated the postoperative course in one patient (2.5%). The postoperative mortality rate was 1.3% (1 patient in the control group).

When performing traditional, "open" surgical interventions, the frequency of intraoperative complications was 9 (22.5%), and when using minimally invasive endosurgical methods, 7 (20.0%).

The course of the postoperative period during which minimally invasive endosurgical surgical interventions were performed was characterized by a decrease in the frequency and severity of postoperative complications from 22.5% to 20.0% in comparison with traditional, "open" operations. We noted that due to the low surgical traumatism of minimally invasive interventions, the low incidence of postoperative complications, there was a short duration of the postoperative bed day (12.5±2.6 days) compared with traditional, "open" operations (19.7±3.8 days).

The use of minimally invasive interventions for ulcerative duodenal bleeding was accompanied by a significant reduction in the rehabilitation period compared with that after traditional, "open" operations, which amounted to 18.3±3.6 and 35.5±5.9 days, respectively.

**Conclusion**

The treatment outcome is influenced by factors such as patient age, disease onset, severity of concomitant pathology, extent of perforitons, and duration of ulcerative ananmisis.

**Prospects for future research**

Further research should focus on developing improved treatments for complicated peptic ulcer of the stomach and duodenum.

**Authors’ contribution**

Gasimov N.A. - a) Conception and design; c) Provision of study materials; d) Collection and synthesis of data; e) Analysis and interpretation of results; f) Drafting the manuscript; g) Revision of the manuscript; h) Final approval of the manuscript.

Mammadov N.I. - b) Administrative support; c) Provision of study materials; g) Revision of the manuscript; h) Final approval of the manuscript.

Akberova I.K. - d) Collection and synthesis of data; g) Revising the manuscript; h) Final approval of the manuscript.

Hajieva A.E. - b) Administrative support; c) Provision of study materials; g) Revision of the manuscript; h) Final approval of the manuscript.

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**References**


виразкою хворобою шлунка та дванадцятипалої кишки, з них 220 чоловіків (84,3%) та 41 жінка (15,7 %) віком 18-84 роки. Усі хворі перебували у хірургічних відділеннях Азербайджанського Державного Інституту Удосконалення Лікарів ім. А. Алієва, Науково-хірургічного центру імені М.А. Тогубашева, Сабунчинського медичного центру (Баку, Азербайджан) з 2015 по 2023 роки. Всім хворим з ускладненнями кровотечею та перфорацією виразкою хвороби шлунка та дванадцятипалої кишки виконували клініко-інструментальні обстеження. Ретельно вивчали вихідний загальний стан хворого.

Пациєнтів з ускладненнями кровотечею виразкою хвороби шлунка та дванадцятипалої кишки було 75 (28,7%), з перфорацією - 186 (71,3%). В контрольній групі традиційні, «відкриті» оперативні втручання виконані 164 (62,8%) хворим, а малоінвазивні ендово-видеохірургічні операції були виконані у 97 (37,2%) пацієнтів. З 186 пацієнтів 124 (66,7%) - виконані традиційні ушивання перфоративної гастродуоденальної виразки при лапаротомії, а 62 (33,3%) - малоінвазивні ендово-видеохірургічні оперативні втручання. В контрольній групі 12 (8,4%) хворим виконана резекція шлунка, 10 (5,4%) - ваготомія з пілоропластикою. Найближчі результати радикальних операцій з приводу перфоративної виразки характеризувались більшим відсотком ранніх ускладнень - 5 (41,6%).

Результати. З 186 хворих, прооперованих з приводу перфоративної гастродуоденальної виразки, у 12 (6,5±2,9%) розвинулися ускладнення в післяоперативному періоді: у групі порівняння – у 9 (7,3 %), в основній групі – у 3 (4, 8%) пацієнтів. Отримано статистично значущу меншу тривалість оперативного втручання на 24,8 хвилини, менші терміни госпіталізації, за рахунок зниження тривалості післяопераційного періоду на 5,3 дні, меншу кількість післяоперативних ускладнень – на 2,5%, нижчу післяопераційну летальність – на 2 %. Тривалість лапароскопічного ушивання перфоративної виразки становила середньому 38,6 хв. Тривалість госпіталізації у середньому становила 6,9±1,2 днів.

Застосування малоінвазивних втручань при виразкових дуоденальних кровотечах супроводжувалося значним скороченням періоду реабілітації порівняно з таким після традиційних, «відкритих» операцій, який становив 18,3±3,6 та 35,5±5,9 діб відповідно. Післяоперативна летальность склала 1,3% (помер 1 хворий у контрольній групі). Висновок. Результат лікування залежить від віку хворих, термінів від початку захворювання, вираженості супутньої патології, ступеня поширеності перитоніту та тривалості виразкового анамнезу.