UDC 616.33-006.6-089-06
DOI http://doi.org/10.30978/GS-2023-3-57

ISSN 2786-5584 print
ISSN 2786-5592 online

Postoperative complications for complicated malignant tumours of the stomach

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Objective — to determine the frequency and structure of postoperative complications for malignant tumours of the stomach accompanied by gastrointestinal bleeding.

Materials and methods. The study analysed the treatment outcomes of 101 patients with a malignant tumour of the stomach complicated by bleeding (84 cases), perforation (6 cases), or stenosis (19 cases, with 8 of them having both stenosis and bleeding). These patients underwent inpatient treatment at the Kyiv City Centre for Gastrointestinal Bleeding and the Kyiv City Clinical Hospital of Emergency Medical Help between 2015 and 2020. Out of the patients, 78 (77.2 %) had histologically confirmed cancer, 11 (10.9 %) had GIST, and 12 (11.9 %) had malignant lymphoma.

Results. During the peak period of ongoing and recurrent bleeding, 5 (6 %) patients required emergency surgery, including 2 (40 %) radical and 3 (60 %) non-radical procedures. After proper preoperative preparation and a comprehensive follow-up assessment, 58 (57.4 %) patients underwent radical surgical interventions for stomach cancer complicated by acute gastrointestinal bleeding in the early delayed period. In the early postoperative period, 4 (15.4 %) patients experienced complications after 26 radical gastrectomies combined with jejunogastroplasty. In the delayed period, early postoperative complications occurred in 9 (28.1 %) patients after 32 radical gastric resections. The total postoperative mortality after emergency surgical interventions was 20.0 %. The total postoperative mortality in the early-term period was 5.7 % (5 patients out of 88), which is 3.5 % less compared to emergency operations (the difference is statistically significant, $p \leq 0.05$).

Conclusions. When urgent surgical interventions are carried out at the peak of ongoing and recurrent bleeding, the mortality rate from postoperative complications is 3.5 times higher than when operations are performed in the early delayed period after adequate preparation and comprehensive patient monitoring. The death rate after radical operations is 2.1 times lower than that after palliative and symptomatic operations. As the operations conducted during the peak bleeding period are associated with high postoperative mortality, we believe that they pose a high risk to patients with malignant tumours of the stomach.

Keywords
malignant stomach tumours, gastrointestinal bleeding, complications, perforation, stenosis.

ARTICLE • Received 2023-11-06 • Received in revised form 2023-12-01

Complicated malignant tumours of the stomach are a serious problem requiring urgent abdominal surgery, and every year their number and severity of complications are progressively increasing. The most frequent complication of tumours localised in the stomach is gastrointestinal bleeding, which accounts for 10.8 % of all possible causes of gastrointestinal bleeding, and in 4.6—15.9 % of cases, it is the cause of death after acute stroke [2, 4, 5, 8].

Progress in the treatment of malignant tumours of the stomach complicated by gastrointestinal bleeding was made due to early diagnosis, successful minimally invasive endoluminal endoscopic hemostasis, clarification of the stage of the tumour process, and the performance of both radical and palliative surgical interventions in a significant number of patients after a comprehensive preparation and examination [1, 3, 7].

Operations are rarely performed at the peak of ongoing bleeding, as they are frequently accompanied by postoperative complications and mortality. Only in the presence of major indications

is the decision about the operation made [5, 6]. In the surgical treatment of malignant tumours of the stomach, complicated by bleeding, the attention of surgeons is focused not only on the possibility of radical removal of the tumour but also on the use of new methods of gastrectomy, and subtotal resection of the stomach, and reconstructive esophagojejunoplasty with the formation of small intestinal reservoirs, which restore the function of the lost stomach and significantly improve the functional results of operative interventions and the quality of life of such patients [2].

Objective — to determine the frequency and structure of postoperative complications for malignant tumours of the stomach accompanied by gastrointestinal bleeding.

Materials and methods

The study analysed the treatment outcomes of 101 patients with a malignant tumour of the stomach complicated by bleeding (84 cases), perforation (6 cases), or stenosis (19 cases, with 8 of them having both stenosis and bleeding). These patients underwent inpatient treatment at the Kyiv City Centre for Gastrointestinal Bleeding and the Kyiv City Clinical Hospital of Emergency Medical Help between 2015 and 2020. Out of the patients, 78 (77.2 %) had histologically confirmed cancer, 11 (10.9 %) had GIST, and 12 (11.9 %) had malignant lymphoma.

The most frequent complication of gastric cancer was gastrointestinal bleeding in 61 patients, of whom 8 had bleeding combined with stenosis of the gastric outlet. In all 23 patients with gastric sarcoma, the tumour was complicated by gastrointestinal bleeding. In 40 (47.6 %) patients, gastrointestinal bleeding was of a moderate degree of severity, in 18 (21.4 %) of an average degree of severity, and 26 (31 %) patients had severe bleeding, of whom 7 (27 %) were delivered in a state of severe hemorrhagic shock.

The presence of gastrointestinal bleeding was established on the basis of clinical symptoms and endoscopic examination data. Endoscopic stigmata of bleeding were determined according to the classification Forrest JAH (1974): 10 patients were hospitalised with endoscopic signs of ongoing bleeding (FIA, FIB), 47 patients with unstable hemostasis (13 patients with FIIB and 34 patients with FIIS), and 27 patients were hospitalised with endoscopic signs of stable hemostasis (FIII, defect under fibrin).

A total of 19 (18.8 %) patients were urgently hospitalised due to stenotic malignant tumours of the stomach. Among these patients, 9 (47.4 %) had subcompensated gastric outlet stenosis, 10 (52.6 %) had decompensated gastric outlet stenosis, and 8 (42.1 %) had stenosis concurrent with signs of gastrointestinal bleeding of various degrees of severity.

According to the TNM 8 classification (2018), all patients were hospitalised at different stages of cancer. The largest group included patients in stages III (n = 34), IV (n = 32), and II (n = 25), and the smallest group included patients in stages I and Cr *in situ* (n = 5 each). Among patients with newly diagnosed gastric cancer (n = 51), operative activity was 50.5 % (51 out of 101 patients).

In total, 71 (70.3 %) patients underwent radical surgery, while 30 (29.7 %) had palliative or symptomatic procedures. Radical surgery was conducted at the following stages of the tumour process: I stage and Cr *in situ* — 10 (14.1 %), II—20 (28.2 %), III—23 (32.4 %), IV — 18 (25.3 %).

The research was carried out in accordance with the principles of the Declaration of Helsinki.The research protocol was approved by the Local Ethics Committee of Bogomolets National Medical University. The patients gave their informed consent for the study.

Results and discussion

During the peak period of ongoing and recurrent bleeding, 5 (6 %) patients required emergency surgery, including 2 (40 %) radical and 3 (60 %) non-radical procedures. Among non-radically operated patients, one (20.0 %) patient died on the 4th day of the postoperative period. The cause of death was complete cancerous damage to the stomach, carcinomatosis. The patient had undergone a non-radical surgical intervention, specifically stitching of the vessels of the stomach at the peak of bleeding, due to major indications for it. Thus, the total postoperative mortality after emergency surgical interventions was 20.0 %.

All postoperative complications were classified according to the R. A. Clavien and D. Dindo classification (Table).

After proper preoperative preparation and a comprehensive follow-up assessment, 58 (57.4 %) patients underwent radical surgical interventions for stomach cancer complicated by acute gastrointestinal bleeding in the early delayed period. Of them, 9 (15.5 %) patients underwent radical gastrectomies, 5 (8.6 %) had extended radical gastrectomies with splenectomy and resection of the tail of the pancreas due to tumour growth into neighbouring organs and tissues, and 12 (20.7 %) underwent gastrectomy in combination with gastrojejunoplasty aimed at improving the patient's quality of life in the postoperative period. In the early postoperative period,

Table. **Classification of postoperative complications (according to R. A. Clavien and D. Dindo)**

Grades	Organ System	Complications
I	–	–
II	Respiratory	Hypostatic pneumonia
IIIa	Respiratory Gastrointestinal	Exudative pleurisy Mechanical jaundice
IIIb	Gastrointestinal	Early adhesive intestinal obstruction
IVa	Gastrointestinal	Acute pancreatitis
IVb	Gastrointestinal	Necrotizing pancreatitis
V	Respiratory Others	Thromboembolism of the pulmonary artery Multiple organ failure syndrome

4 (15.4 %) patients experienced complications after 26 radical gastrectomies combined with jejunogastroplasty. The following complications were associated with operative treatment (n = 4): acute postoperative pancreatitis (n = 2), postoperative pancreonecrosis (n = 1), and one patient had left-sided exudative pleurisy. After 32 radical gastric resections in the delayed period, early postoperative complications occurred in 9 (28.1 %) patients. The following complications were related to the operation (n = 5): acute postoperative pancreatitis (n = 2), acute pancreatitis in combination with gastrostasis, atony of the gastric stump (n = 1), early ileal intestinal obstruction (n = 1), and mechanical jaundice in combination with right-sided exudative pleurisy (n = 1).

Complications unrelated to surgery were noted in 4 patients: hypostatic pneumonia (n = 1), exudative pleurisy (n = 2), and pulmonary embolism, SPON (n = 1).

In general, 16 complications were observed in 13 patients, with 8 (50 %) being concurrent. On average, each patient reported 1.2 complications. It was noted that patients experienced the same number of complications during standard radical resections of the stomach and radical gastrectomies. The frequency of complications depended on the cancer stage, duration, and volume of the surgical intervention.

In the early delayed period, 3 (2.9 %) patients underwent repeated surgical procedures due to the occurrence of early postoperative complications after radical surgical interventions. The major indications for repeated surgery were identified as follows: early ileal intestinal obstruction — relaparotomy, ileal dissection, nasogastric intubation of the intestine, and laparostomy (9th day of the postoperative period after standard radical resection of the stomach); postoperative pancreonecrosis (10th day after gastrectomy) — relaparotomy, sequestrectomy (one patient was operated on the 8th day after gastrectomy due to acute pancreatitis); acute cholecystitis — sequestrectomy, cholecystectomy, and external choledochal drainage, according to Pikovsky.

Acute postoperative pancreatic necrosis, a surgery-related complication, caused one (3.0 %) fatal case. Another case (3.0 %) resulted in death due to the development of pulmonary embolism and multiple organ failure syndrome. Thus, in the early delayed period, postoperative complications after radical surgical interventions contributed to a mortality rate of 3.4 %.

After non-radical surgical interventions (n = 30) due to the fourth stage of oncological disease, a fatal outcome occurred in three cases: 1 patient died 5 hours after laparotomy accompanied by suturing of gastric vessels (at the peak of heavy profuse bleeding from a tumour in the stomach), and 1 patient with the fourth stage of stomach cancer and carcinomatosis died 5 days after a diagnostic laparotomy due to the progression of the disease. On the 5th day of the postoperative period, one patient who had undergone palliative subtotal resection of the stomach experienced a fatal outcome after repeated surgical intervention due to perforation of an acute ulcer of the gastric stump and postoperative pancreatitis. Therefore, in the early delayed period, postoperative complications after non-radical surgical procedures resulted in a mortality rate of 10.0 %, which is two times less compared to the mortality rate observed after emergency operations (the difference is statistically significant, $p \le 0.05$).

The total postoperative mortality in the early-term period was 5.7 % (5 patients out of 88), which is 3.5 % less compared to emergency operations (the difference is statistically significant, $p \le 0.05$).

Conclusions

When urgent surgical interventions are carried out at the peak of ongoing and recurrent bleeding, the mortality rate from postoperative complications is 3.5 times higher than when operations are performed in the early delayed period after adequate preparation and comprehensive patient monitoring.

The death rate after radical operations is 2.1 times lower than that after palliative and symptomatic operations. As the operations conducted during the peak bleeding period are associated with high postoperative mortality, we believe that they pose a high risk to patients with malignant tumours of the stomach.

The optimal standard approach includes a complex of minimally invasive methods of endosurgical hemostasis used in the early delayed period to stop ongoing bleeding and prevent its recurrence.

Declaration of interests

The authors declare that they have no conflict of interest.

Authors contributions

P. V. Ivanchov: concept and design of the study, collection, analysis, and interpretation of data, drafting and revision of the manuscript; V. V. Skyba: collection, analysis, and interpretation of data. R. I. Vereshchako: collection, analysis, and interpretation of data.

Financing. There were no external sources of funding or support. No fees or other compensation were paid.

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Ускладнення після хірургічного лікування ускладнених злоякісних пухлин шлунка

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Мета — установити частоту виникнення та структуру ускладнень після хірургічного лікування злоякісних пухлин шлунка, ускладнених шлунково-кишковою кровотечею.

Матеріали та методи. Проаналізовано результати лікування 101 хворого зі злоякісною пухлиною шлунка, що ускладнилася кровотечею (84), перфорацією (6), стенозом (19), комбінацією стенозу та кровотечі (8), які перебували на стаціонарному лікуванні в київському міському Центрі шлунково-кишкових кровотеч та Київській міській клінічній лікарні швидкої медичної допомоги в період із 2015 до 2020 р. За результатами гістологічного дослідження, 78 (77.2 %) пацієнтів мали рак, 11 (10.9 %) — гастроінтестинальні стромальні пухлини (GIST), 12 (11.9 %) — злоякісну лімфому.

Результати. В екстреному порядку на висоті кровотечі, що тривала, або її рецидиву прооперовано 5 (6 %) пацієнтів, з них радикально — 2 (40 %), нерадикально — 3 (60 %). З приводу гострокровоточивої пухлини шлунка в ранній відтермінований період після проведення адекватної доопераційної підготовки та комплексного дообстеження прооперовано 58 (57.4 %) пацієнтів, яким вдалося виконати радикальні оперативні втручання. Після 26 радикальних гастректомій (разом з єюногастропластикою) у ранній післяопераційний період ускладнення виникли в 4 (15.4 %) хворих, після 32 радикальних резекцій шлунка у відтермінований період — у 9 (28.1 %). Загальна післяопераційна летальність після екстрених оперативних втручань становила 20.0 %, загальна летальність у ранній відтермінований період — 5.7 % (5 пацієнтів із 88), що на 3.5 % менше порівняно з втручаннями, проведеними в екстреному порядку ($p \le 0.05$).

Висновки. Летальність від післяопераційних ускладнень після ургентних оперативних втручань на висоті кровотечі, що тривала, або її рецидиву на 3.5 % вища, ніж після операцій, виконаних у ранній відтермінований період після адекватної підготовки. Частота летальних наслідків після радикальних операцій була в 2.1 разу меншою порівняно з такою після паліативних і симптоматичнимх операцій, тому, на нашу думку, операції на висоті кровотечі у хворих на злоякісні пухлини шлунка є надто небезпечними, що пов'язано з високою післяопераційною летальністю.

Ключові слова: злоякісні пухлини шлунка, шлунково-кишкова кровотеча, ускладнення, перфорація, стеноз.

FOR CITATION

Ivanchov PV, Skyba VV, Vereshchako RI. Postoperative complications for complicated malignant tumours of the stomach. General Surgery (Ukraine). 2023;3-4;57-60. http://doi.org/10.30978/GS-2023-3-57.