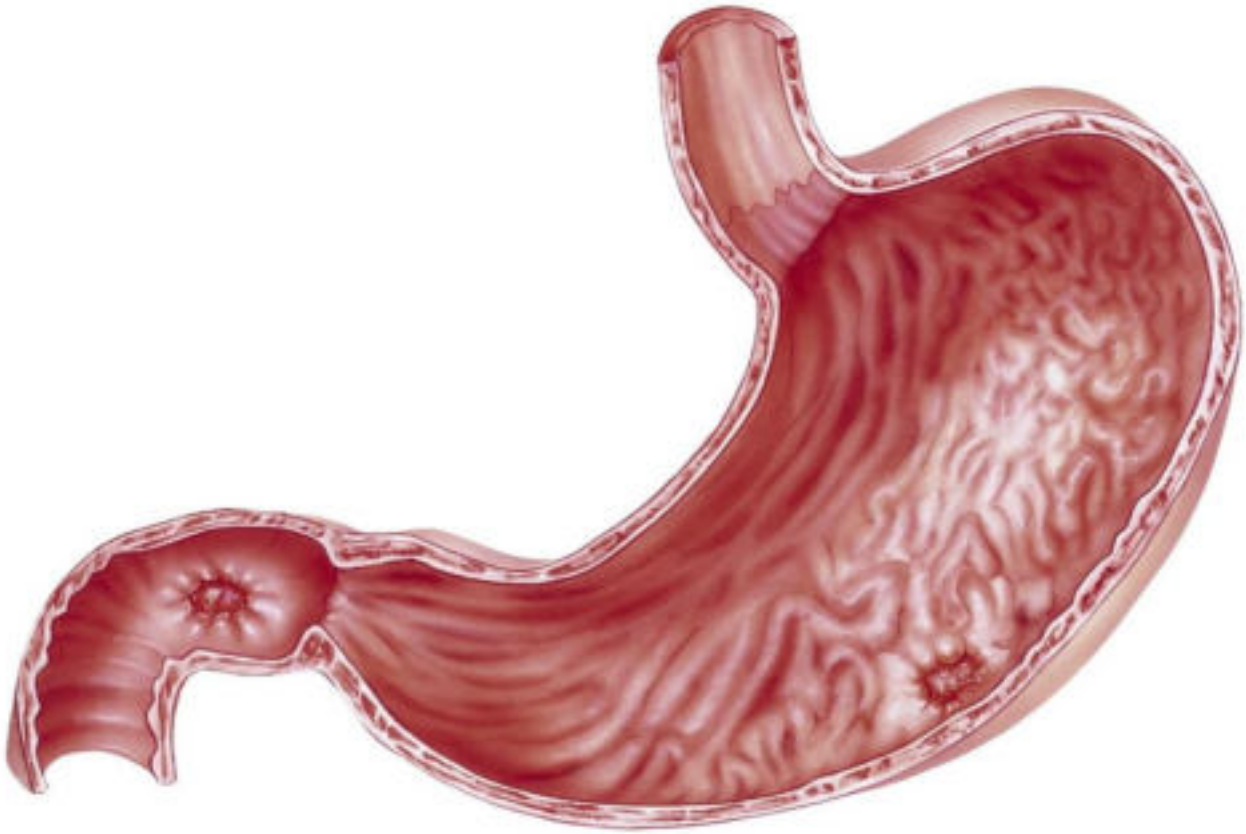
ROYAL METROPOLITAN UNIVERSITY

Department of Clinical Disciplines

STOMACH AND DUODENAL ULCER

Educational and methodological manual



BISHKEK 2022

UDC 616.33-002.44(575.2)

S86

Printed on the recommendation of the RMU Academic Council, Protocol № 1 dated 09.09.2022.

Compiled by:

Toktosunov U.T.,

Nazir Muhammad Imran,

Jaxymbaev N. B.

Saliev A.Zn.

The educational and methodical manual is devoted to gastric and duodenal ulcer. Objectives and tasks are spelled out in a form understandable to students. The presentation of the material is intended to provide students with a unified picture, since this material is based on a universally recognized academic structure in the world, starting with definition, etiology / pathogenesis and ending with diagnosis, treatment. In order to check the level of students' knowledge, control questions, tests and tasks, and situational problems are given.

The educational and methodical manual is written in English at the highest level and is intended for international students of the 7th semester of the Faculty of "Medical Science" of the RMU.

Reviewers:

Doctor of Medical Sciences, Professor of the Department of Clinical Disciplines RMU Kenzhaev M.G.

Doctor of Medical Sciences, acting Professor of the Department of Faculty Surgery named after Kakish Ryskulova of I.K. Akhunbaev KSMA Aitbaev S.A.

Table of contents

1. Introduction

Relevance. Stomach and duodenal ulcer disease affects from 5 to 10% of the adult population of the World. Postoperative complications, depending on the type of surgical intervention, in case of a perforated ulcer reach 6-26%, and mortality — 5-18%, in case of a bleeding ulcer, complications develop in 5-40%, mortality— in 7-20% of patients. In the long-term period, diseases of the operated stomach and relapses of peptic ulcer disease after palliative interventions develop in 10-70% of patients, after radical ones-in 5-60% and are mainly found in patients operated on in an emergency [1, 2].

The purpose of the lesson

To show the importance of the problem of gastric ulcer and duodenal ulcer in the clinic, to teach the basics of ulcer diagnosis, as well as the principles of surgical treatment and rehabilitation measures for this disease.

Lesson objectives

The student should know:

-The anatomy and physiology of the stomach, the histological structure of the gastric mucosa (main, lining, mucus-forming cells, gastrin cells), the phases of gastric secretion; the incidence of peptic ulcer;

-The causes of ulcers in the stomach and 12-duodenum (a feature of the etiopathogenesis of gastric ulcers and 12-duodenum);

-Stages of the course and its complications;

-Features of the clinical course of gastric ulcer and duodenal ulcer, features of complications depending on the location of the ulcer;

-The clinic of ulcerative bleeding, be able to determine the degree of blood loss, know conservative and operative methods of stopping bleeding;

-Methods of examination of the stomach and 12-duodenum;

-Principles of surgical and conservative treatment of bleeding ulcers;

-Principles of preparation of patients for surgery and management of the postoperative period. Types of operations for bleeding ulcers;

-Complications in the early postoperative period, their clinic, diagnosis and treatment.

The student must be able to:

-Collect medical history and conduct an objective study of the patient.

-Make a preliminary diagnosis indicating the location of the ulcer and complications.

-Outline a plan for the patient's examination. Evaluate the data of additional research methods in order to clarify the diagnosis.

-Read and interpret:

a) general and biochemical analyses;

b) radiographs of the stomach and duodenum 12;

c) endoscopic examination of the stomach and duodenum;

d) gastric secretion data.

-Diagnose complications in the early and long-term postoperative period.

-Outline a treatment plan for the patient. Evaluate the outcome of treatment and make recommendations for rehabilitation and working capacity.

-Issue documentation of patients with various forms of the disease and complications of peptic ulcer disease (patient card, medical history, resort map, messenger of the sheet to the expert Commission documents at the time of discharge from the hospital, certificate, extract from the medical history, medical certificate, certificate vouchers, etc.).

-Make a differential diagnosis with gastric cancer syndrome Mallory-Weiss syndrome, portal hypertension, erosive gastritis, diseases of the blood, etc.

Basic knowledge. The student should have an idea based on knowledge of anatomy, physiology, histology, pathanatomy, pathophysiology about the anatomical and physiological function of the stomach and the duodenum, about possible violations of the secretory activity of the stomach as the main links in the pathogenesis of peptic ulcer disease.

2. Definition

Peptic ulcer disease (PUD) is a chronic recurrent disease that occurs with alternating periods of exacerbation and remission, the leading manifestation of which is the formation of a defect (ulcer) in the wall of the stomach and duodenum.

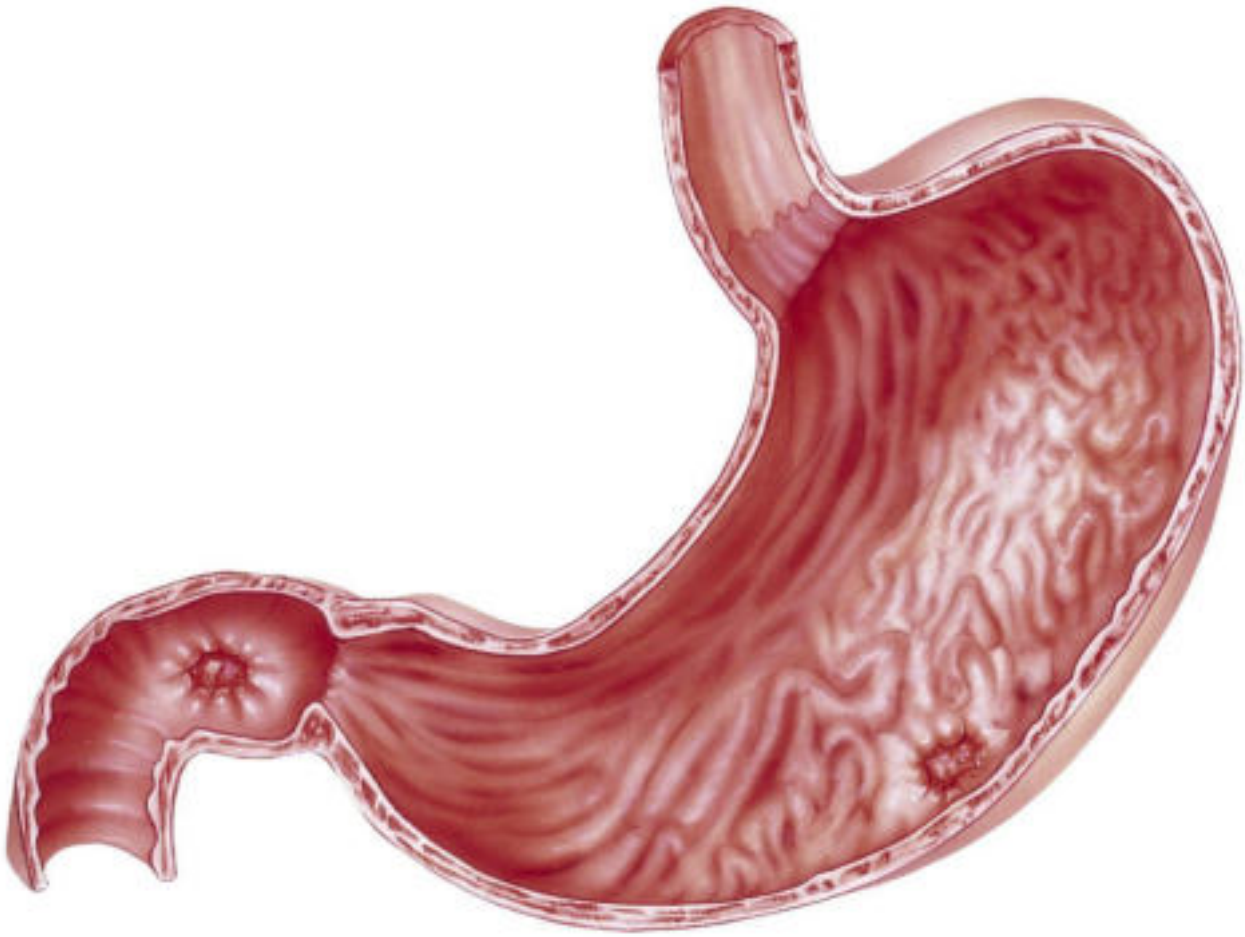


Fig. 2.1 Peptic ulcers

3. Etiology and pathogenesis

According to modern concepts, the pathogenesis of PUD in general is reduced to a violation of the balance between the factors of acid-peptic aggression of the gastric contents and the elements of protection of the gastric and duodenal mucosa.

The aggressive link of ulceration includes an increase in the mass of the lining cells (often hereditary), hyperproduction of gastrin, violation of the nervous and humoral regulation of gastric acid production, increased production of pepsinogen

and pepsin, violation of gastroduodenal motility (delay or, conversely, acceleration of evacuation from the stomach, contamination of the gastric mucosa with Helicobacter pylori (H. pylori) microorganisms.

The weakening of the protective properties of the mucous membrane of the stomach and duodenum may occur as a result of lower production and violations of the qualitative composition of gastric mucus, reducing bicarbonate secretion, reduce the regenerative activity of epithelial cells, impairment of the blood supply of the gastric mucosa, decrease the amount of prostaglandins in the stomach (for example, nonsteroidal anti-inflammatory drugs (NSAIDs).

A crucial role in the development of PUD is currently assigned to the microorganisms H. pylori, discovered in 1983 by Australian scientists B. Marshall (B. Marshall) and J. R. R. Tolkien. By J. Warren.

The spectrum of adverse effects of H. pylori on the mucous membrane of the stomach and duodenum is quite diverse. These bacteria produce a number of enzymes (urease, protease, phospholipase) that damage the protective barrier of the mucous membrane, as well as various cytotoxins. The most pathogenic are the VacA strain of H. pylori, which produces a vacuolatingcytotoxin that leads to the formation of cytoplasmic vacuoles and the death of epithelial cells, and the CagA strain, which expresses a gene associated with the cytotoxin. pylori promote the release of interleukins, lysosomal enzymes, and tumor necrosis factor in the gastric mucosa, which causes the development of inflammatory processes in the gastric mucosa.

Contamination of the gastric mucosa with N. pylori is accompanied by the development of superficial antral gastritis and duodenitis and leads to an increase in the level of gastrin, followed by an increase in the secretion of hydrochloric acid. An excessive amount of hydrochloric acid, entering the lumen of the duodenum, under conditions of a relative deficiency of pancreatic bicarbonates, contributes to the progression of duodenitis and, in addition, causes the appearance in the duodenum of areas of gastric metaplasia (rearrangement of the epithelium of the duodenal mucosa according to the gastric type), which are quickly populated by H. pylori. In the future, with an unfavorable course, especially in the presence of additional etiological factors

(hereditary predisposition, 0 (I) blood type, smoking, neuropsychiatric stress, etc.), an ulcerative defect is formed in the areas of the metaplastic mucosa. About 80% of duodenal ulcers and 60% of gastric ulcers are associated with H. pylori.

4. Classification

There is no generally accepted classification of PUD. First of all, depending on the presence or absence of H. pylori infection, PUD is isolated, associated and not associated with H. pylori infection. The latter form is sometimes also called idiopathic. There is also a distinction between PUD as an independent disease (essential peptic ulcer) and symptomatic ulcers of the stomach and duodenum (medicinal, "stressful", with endocrine pathology, with other chronic diseases of the internal organs), which occur against the background of other diseases and are associated with special etiological and pathogenetic factors by the mechanisms of their development.

Depending on the localization, there are gastric ulcers (cardiac and subcardial divisions, the body of the stomach, the antrum, the pyloric canal), duodenal ulcers (bulbs, postbulbar division, as well as combined ulcers of the stomach and duodenum. In this case, ulcers can be located on the small or large curvature, the anterior and posterior walls of the stomach and duodenum.

According to the number of ulcerative lesions, there are single and multiple ulcers, and depending on the size of the ulcer defect – ulcers of small (up to 0.5 cm in diameter) and medium (0.6-1.9 cm in diameter) sizes, large (2.0 - 3.0 cm in diameter) and giant (over 3.0 cm in diameter) ulcers.

The diagnosis indicates the stage of the course of the disease: exacerbation, scarring (endoscopically confirmed stage of "red" and "white" scar) and remission, as well as the existing scar-ulcer deformity of the stomach and duodenum.

When formulating the diagnosis, the presence of complications of PUD (including anamnestic ones) is indicated): bleeding, perforation, penetration,

cicatricial-ulcerative stenosis of the pylorus, as well as the nature of surgical interventions, if they were performed.

5. Clinical picture

The main symptom exacerbation PUD are pain in the epigastric region that may radiate to the left side of the chest and left shoulder, thoracic or lumbar spine, Pain occurs immediately after eating (for ulcers and cardiac subcatalog divisions of the stomach), after half an hour after eating (for ulcers of the stomach). With ulcers of the pyloric canal and the duodenal bulb, late pain (2-3 hours after eating), "hungry" pain that occurs on an empty stomach and passes after eating, as well as night pain, Pain passes after taking antisecretory and antacid drugs are usually observed.

With an exacerbation of PUD, acid belching, nausea, and constipation are also common. Vomiting with acidic gastric contents, which brings relief and is therefore artificially induced by patients, has always been considered a sign of PUD, however, it is now relatively rare. With the exacerbation of the disease, weight loss is often noted, because, despite the preserved, and sometimes even increased appetite, patients limit themselves in food, fearing increased pain.

The clinical symptoms observed in the exacerbation of peptic ulcer disease are not pathognomonic and can occur in other diseases (for example, chronic gastritis and duodenitis with functional dyspepsia syndrome), so the diagnosis of PUD must necessarily be confirmed by other research methods.

During the period of exacerbation of PUD, an objective study often reveals pain in the epigastric region during palpation, combined with moderate resistance of the muscles of the anterior abdominal wall. There may also be local percussive pain in the same area (Mendel's symptom).

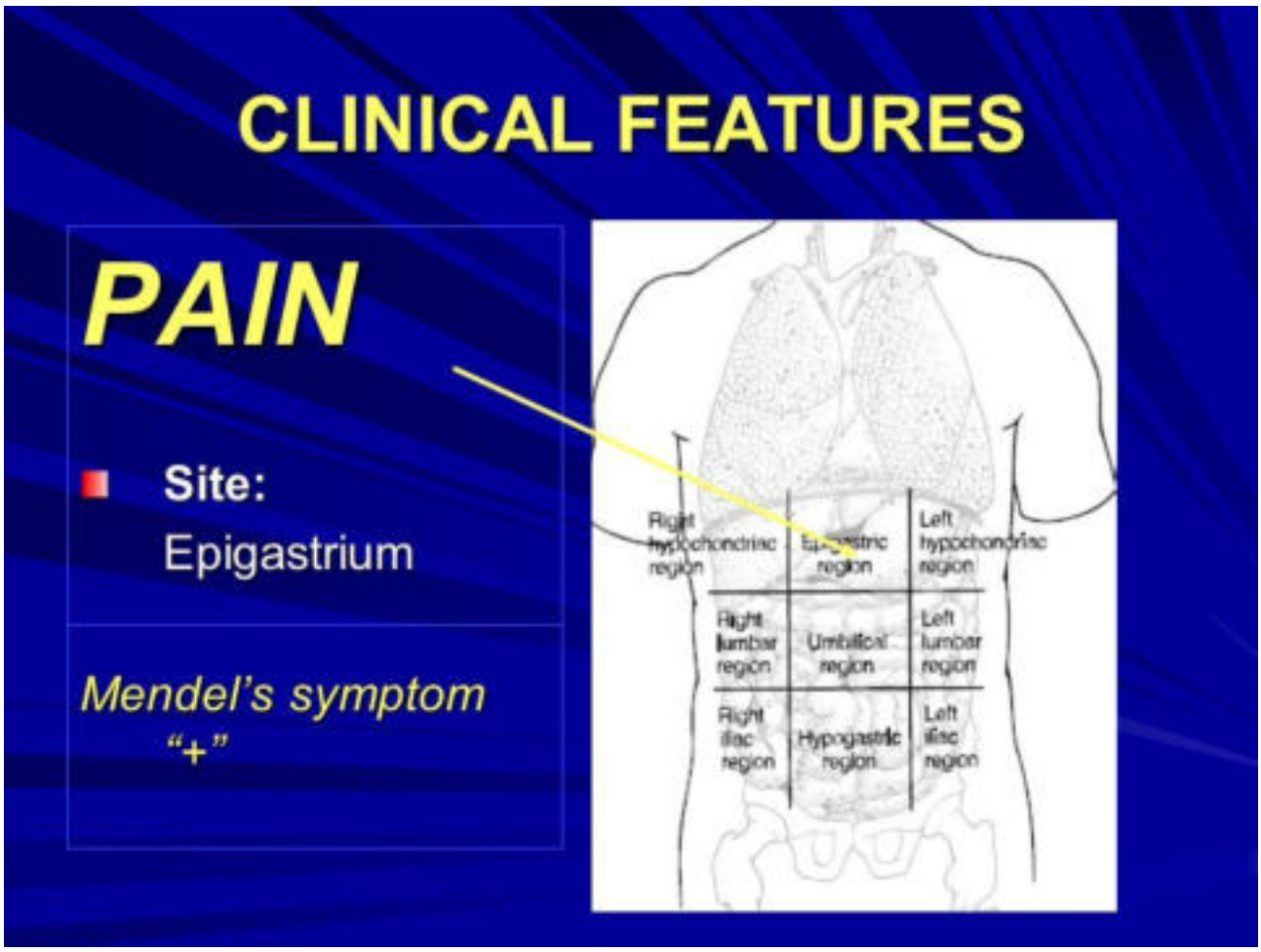


Fig. 5.1 Mendel's symptom

However, these signs are not strictly specific for the exacerbation of PUD. Typical for PUD are seasonal (spring and autumn) periods of increased pain and dyspeptic symptoms.

In uncomplicated cases, PUD usually occurs with alternating periods of exacerbation (lasting from 3-4 to 6-8 weeks) and remission (lasting from several weeks to many years). Under the influence of adverse factors (for example, such as physical exertion, taking NSAIDs and/or drugs that reduce blood clotting, alcohol abuse), complications may develop. These include bleeding, perforation and penetration of the ulcer, the formation of cicatricial-ulcerative stenosis of the pylorus, malignancy of the ulcer).

Ulcerative bleeding is observed in 15-20% of patients with PUD, more often with the localization of ulcers in the stomach. The risk factors for its occurrence are the use of acetylsalicylic acid and NSAIDs, H. pylori infection and the size of ulcers

>1 cm. Ulcerative bleeding is manifested by vomiting of the contents of the "coffee grounds" type (hematemesis) or black tar-like stool (melena). With massive bleeding and low secretion of hydrochloric acid, as well as the localization of the ulcer in the cardiac part of the stomach, an admixture of unchanged blood may be observed in the vomit. Sometimes the first place in the clinical picture of ulcerative bleeding is taken by general complaints (weakness, loss of consciousness, decreased blood pressure, tachycardia), while melena may appear only after a few hours.

Perforation (perforation) ulcers occur in 5-15% of patients with PUD, more often in men. Physical overexertion, alcohol intake, and overeating predispose to its development. Sometimes the perforation occurs suddenly, against the background of an asymptomatic ("silent") course of PUD. Perforation of the ulcer is clinically manifested by acute ("dagger") pain in the epigastric region, the development of a collaptoid state. When examining the patient, a "board-like" tension of the muscles of the anterior abdominal wall and sharp pain during palpation of the abdomen, a positive symptom of Bloomberg,

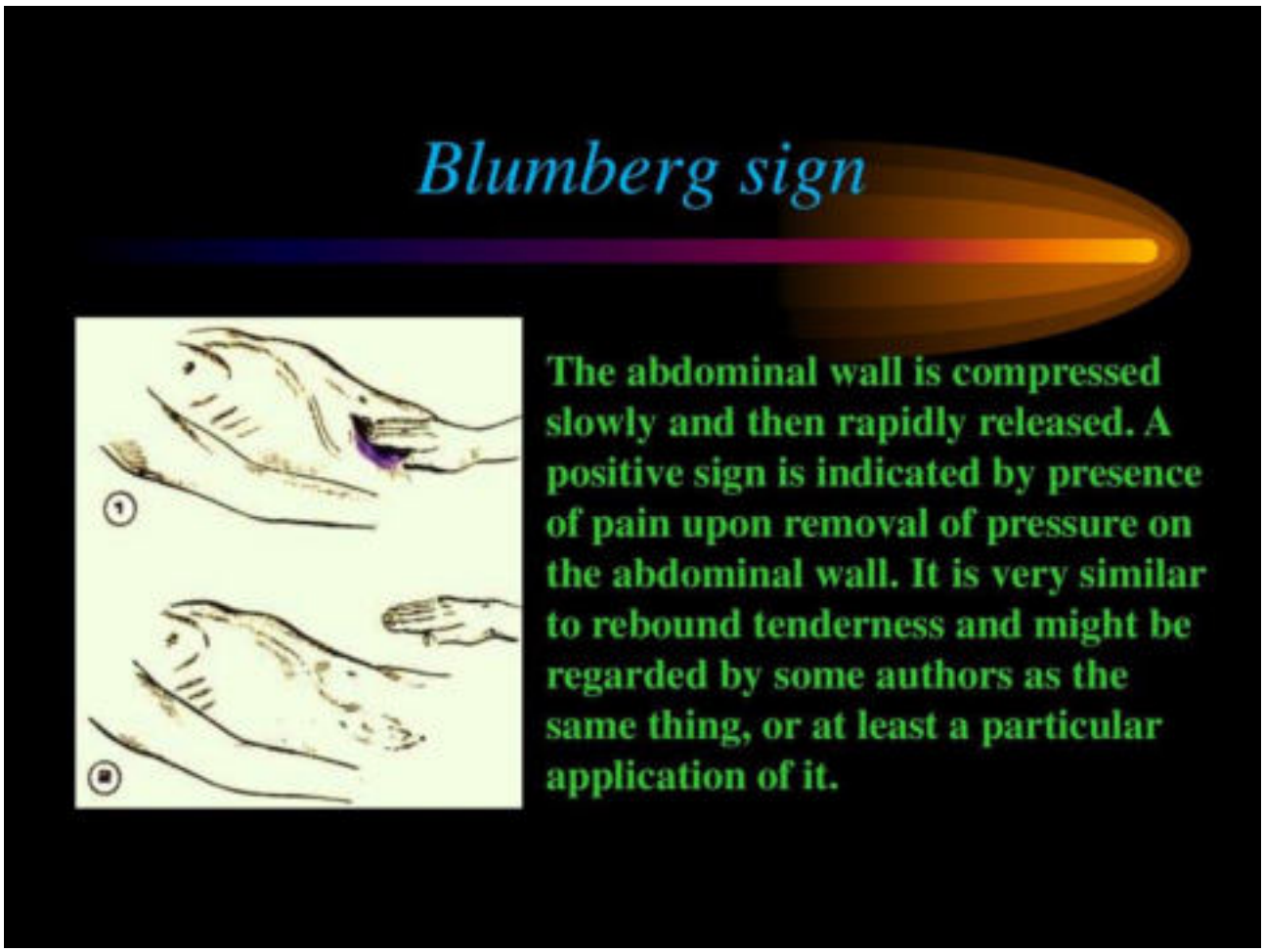


Fig. 5.2 Symptom of Bloomberg

are detected. In the future, sometimes after a period of imaginary improvement, the picture of spilled peritonitis progresses.

By penetration, we mean the penetration of a stomach ulcer or duodenal ulcer into the surrounding tissues: the pancreas, the small omentum, the gallbladder and the common bile duct. When the ulcer penetrates, persistent pains occur, which lose their previous connection with food intake, the body temperature rises, and an increase in ESR is detected in blood tests. The presence of ulcer penetration is confirmed radiologically and endoscopically.

Pyloric stenosis is usually formed after scarring of ulcers located in the pyloric canal or the initial part of the duodenum. Often, the development of this complication is facilitated by the operation of suturing a perforated ulcer in this area. The most characteristic clinical symptoms of pyloric stenosis are vomiting of food eaten the day before, as well as belching with the smell of hydrogen sulfide. When palpating

the abdomen in the epigastric region, you can detect "late splashing noise" (Vasilenko'ssymptom), in thin patients, stomach peristalsis sometimes becomes visible. With decompensated pyloric stenosis, the depletion of patients may progress, and electrolyte disturbances are added.

Malignancy (malignancy) of a benign stomach ulcer is not as common a complication as previously thought. For malignancy of the ulcer, cases of timely unrecognized infiltrative-ulcerative stomach cancer are often mistaken. Diagnosis of ulcer malignancy is not always easy. Clinically, it is sometimes possible to note a change in the nature of the course of PUD with the loss of periodicity and seasonality of exacerbations. Blood tests show anemia, increased ESR. The final conclusion is made during the histological examination of biopsies taken from various areas of the ulcer.

Certain features of the clinical picture are inherent in symptomatic ulcers that occur against the background of other diseases or when taking medications.

Thus, stress gastroduodenal ulcers include acute, usually multiple ulcers of the stomach and duodenum, which occur in common burns (Curling ulcers),

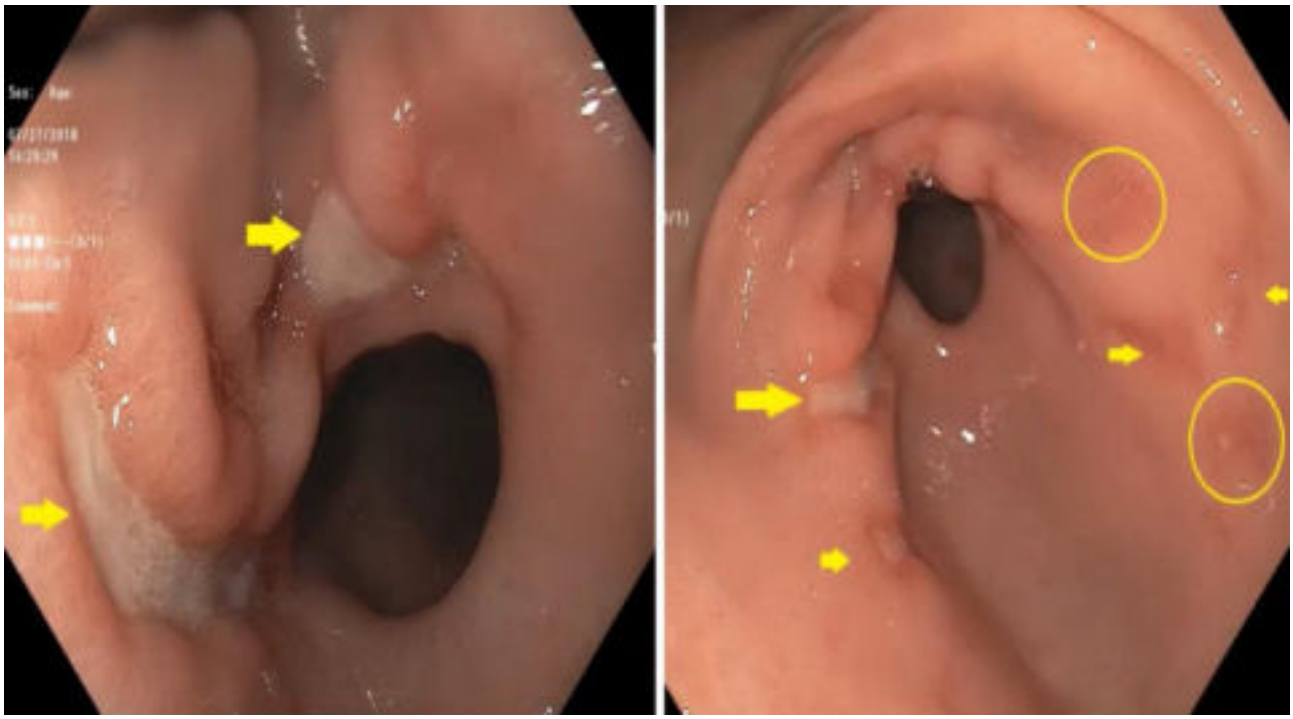


Fig. 5.3Curling ulcers

after traumatic brain injuries and eye surgery (Cushing's ulcers), after extensive abdominal operations, especially those associated with organ transplantation, in acute myocardial infarction, in patients with end-stage chronic kidney and liver failure, and other critical conditions. conditions, usually acute, multiple, often occur with little symptoms, they are characterized by a tendency to gastrointestinal diseases and are characterized by high mortality, often due to the severe course of the background disease.

Among the medicinal ulcers of the stomach and duodenum, the most important are acute erosive and ulcerative lesions associated with the use of NSAIDs (NSAIDs gastropathy), which block the enzyme cyclooxygenase-1, which is responsible for the synthesis of prostaglandins in the stomach wall. Gastroduodenal ulcers occur in 20-25% of patients who take NSAIDs for a long time, erosive lesions occur in more than 50% of patients. The risk factors include older age, a history of ulcerative disease, concomitant diseases of the cardiovascular system and the liver, high dose NSAIDs, concomitant use of anticoagulants.

Gastroduodenal ulcers and erosions caused by taking NSAIDs are also often multiple in nature, often occur with little symptoms and are manifested by sudden gastrointestinal bleeding (melena or vomiting of the contents of the "coffee grounds" type). The risk of their development in such patients increases by 4-5 times.

6. Diagnosis

Criteria for establishing the diagnosis of the disease/condition:

The diagnosis of peptic ulcer disease is established on the basis of

1) Anamnestic data (characteristic complaints, detection of peptic ulcer disease))

2) Physical examination (detection of soreness and resistance of the abdominal wall muscles during palpation)

3) Instrumental examination (detection of an ulcer defect during endoscopic and X-ray examination of the stomach and duodenum)

Complaints and anamnesis (see the subsection "Clinical picture of the disease or condition (group of diseases or conditions)").

Physical examination (see the subsection "Clinical picture")

Laboratory diagnostic tests

In order to exclude anemia as a consequence of latent ulcerative bleeding, a general blood test with hemoglobin and hematocrit levels is recommended for all patients with PUD

Level of credibility of recommendations B (level of reliability of evidence-3)

Comments on: The clinical blood test in the uncomplicated course of PUD most often remains without significant changes, but anemia can also be detected, indicating obvious or hidden bleeding

Fecal occult blood tests are recommended for all patients with PUD in order to exclude latent ulcerative bleeding.

Level of credibility of recommendations B (level of reliability of evidence-2)

Comments on: A certain place in the diagnosis of exacerbations of PUD is occupied by the analysis of feces for hidden blood. When interpreting its results, it is necessary to remember that a positive reaction of feces to hidden blood is also found in many other diseases, which requires their mandatory exclusion.

Instrumental diagnostic tests [7]

Esophagogastroduodenoscopy

Fig. 6.1Esophagogastroduodenoscopy

is recommended for all patients with suspected PUD, in the absence of contraindications, in order to confirm the diagnosis.

Level of credibility of recommendations C (level of reliability of evidence – 5)

Comments: Endoscopic examination confirms the presence of an ulcer defect, clarifies its localization, depth, shape, size, allows you to assess the condition of the bottom and edges of the ulcer, to identify concomitant changes in the mucous membrane, violations of gastroduodenal motility. When the ulcer is localized in the stomach, a biopsy is performed with subsequent histological examination, which allows to exclude the malignant nature of the ulcerative lesion.

Patients with suspected PUD who cannot perform an endoscopic examination are recommended to perform a stomach and duodenal X-ray

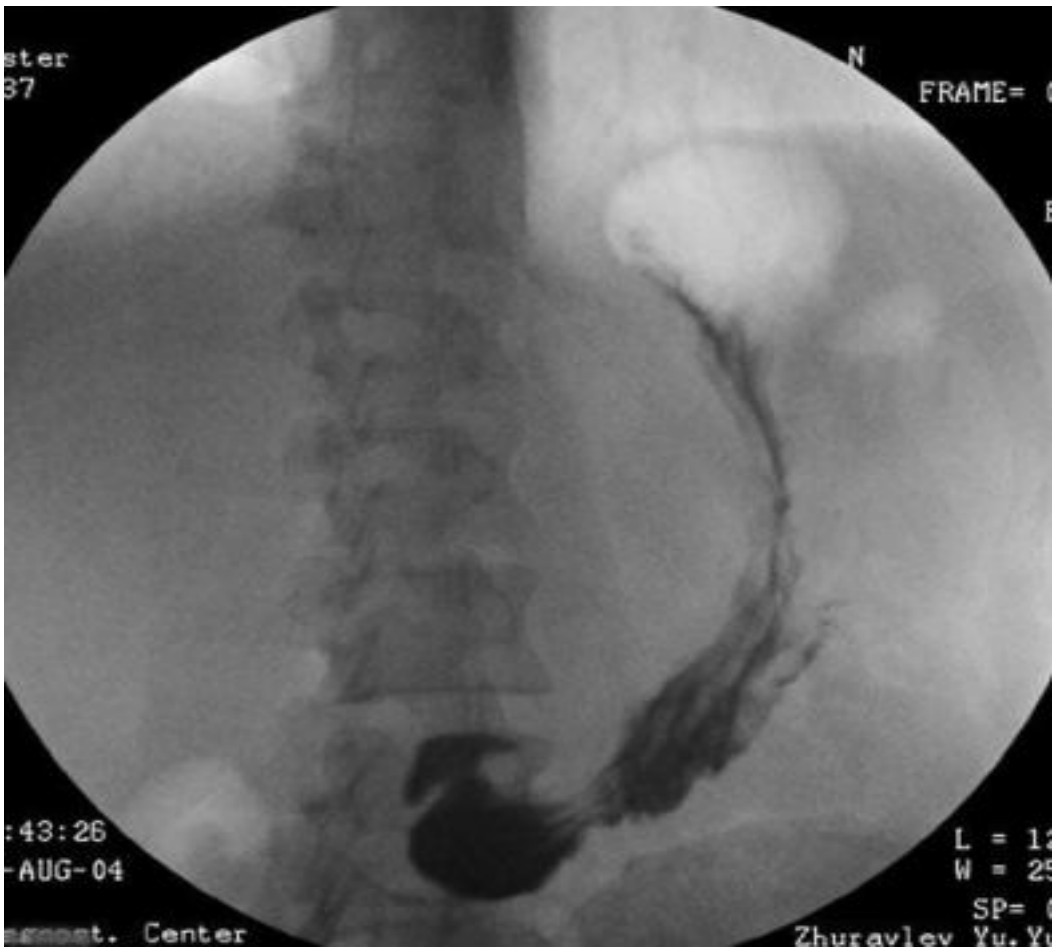


Fig. 6.2 Stomach and duodenal X-ray

to confirm the diagnosis.

Level of credibility of recommendations C (level of reliability of evidence – 5)

Comments on: X – ray examination reveals a direct sign of PUD-"niche" on the contour or on the relief of the mucous membrane and indirect signs of the disease (local circular spasm of muscle fibers on the opposite wall of the stomach in the form of a "pointing finger", convergence of the folds of the mucous membrane to the "niche", scar-ulcer deformation of the stomach and duodenal bulb, fasting hypersecretion, gastroduodenal disorders motor skills. Currently, X-ray examinations for the diagnosis of PUD are not used as often as before. It is used in cases where for some reasons (for example, the presence of contraindications) it was not possible to endoscopic examination, when the goal differential diagnosis of infiltrative-ulcerous cancer it is necessary to evaluate the motility of the stomach wall when you need to assess the nature of gastric emptying.

Patients with suspected ulcer perforation are recommended to perform computed tomography of the abdominal organs in order to confirm it.

Level of credibility of recommendations B (level of reliability of evidence-4)

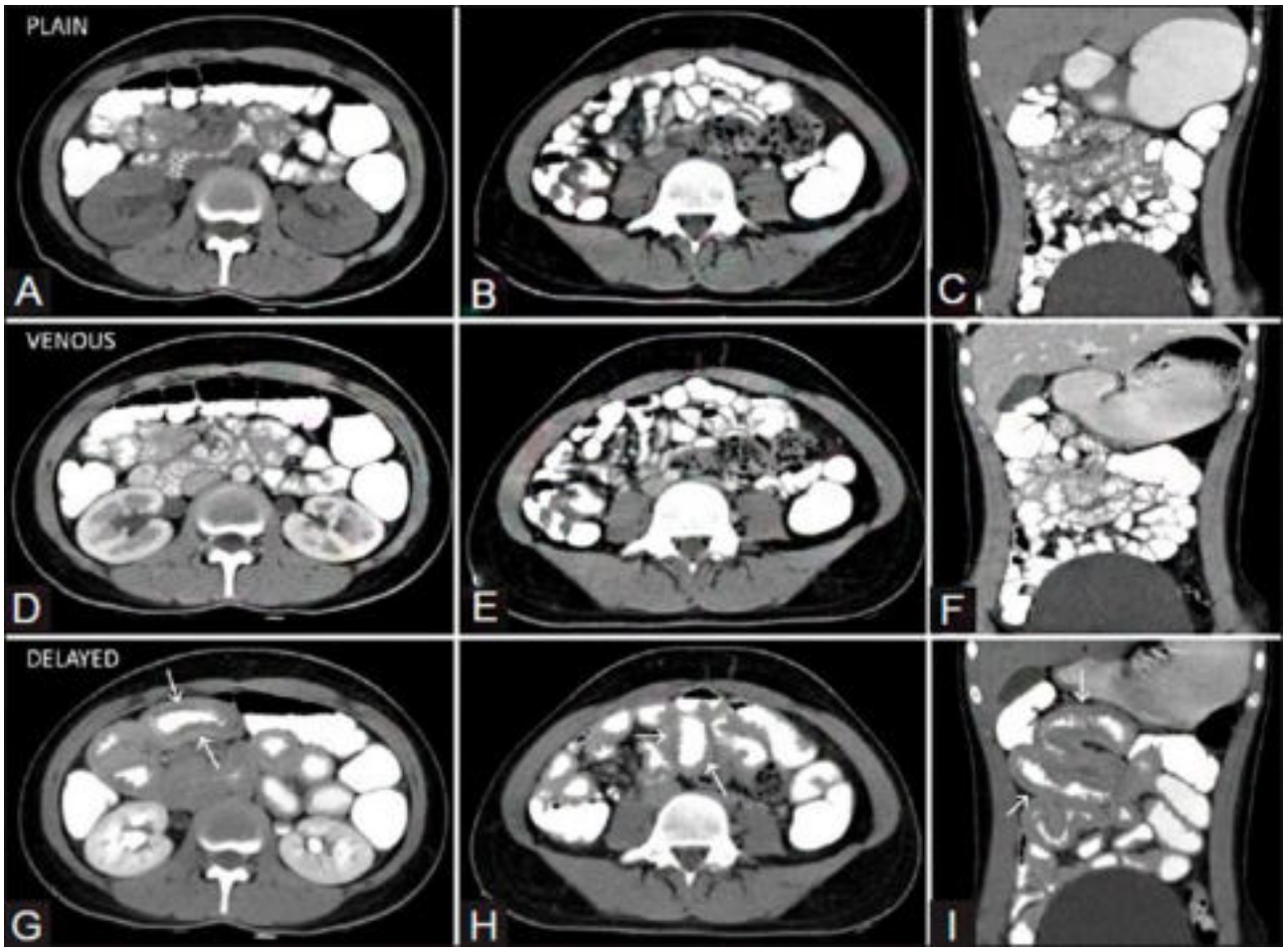


Fig. 6.3 CT of the abdominal organs

Comments: This method allows you to determine the presence of free gas in the abdominal cavity, the volume and nature of the effusion, to localize pathological changes, including to determine the location of the perforation hole. In patients with suspected perforation or penetration of the ulcer, if CT is not possible, it is recommended to perform ultrasound and review radiography of the abdominal organs in order to diagnose these complications.

Level of credibility of recommendations B (level of reliability of evidence-4)

Fig. 6.4 Ultrasound of the abdominal organs

Comments: An important criterion for preserving the patient's life and success in the treatment of perforated gastric ulcer and/or duodenal ulcer is the preoperative period - the time from the onset of the disease to the moment of surgery. A prolonged diagnostic search can lead to a deterioration in the patient's condition, followed by an unfavorable prognosis. Only in the absence of CT in the medical institution, it is possible to perform ultrasound and radiography of the abdominal cavity to diagnose the perforation of the ulcer.

It should be remembered that the sensitivity and specificity of these methods are lower than those compared to CT, and the result largely depends on the qualification of a specialist in ultrasound diagnostics.

Other diagnostic tests

In order to determine the indications for eradication therapy, all patients with PUD are recommended to test for the presence of H. pylori infection using a 13C respiratory urease test

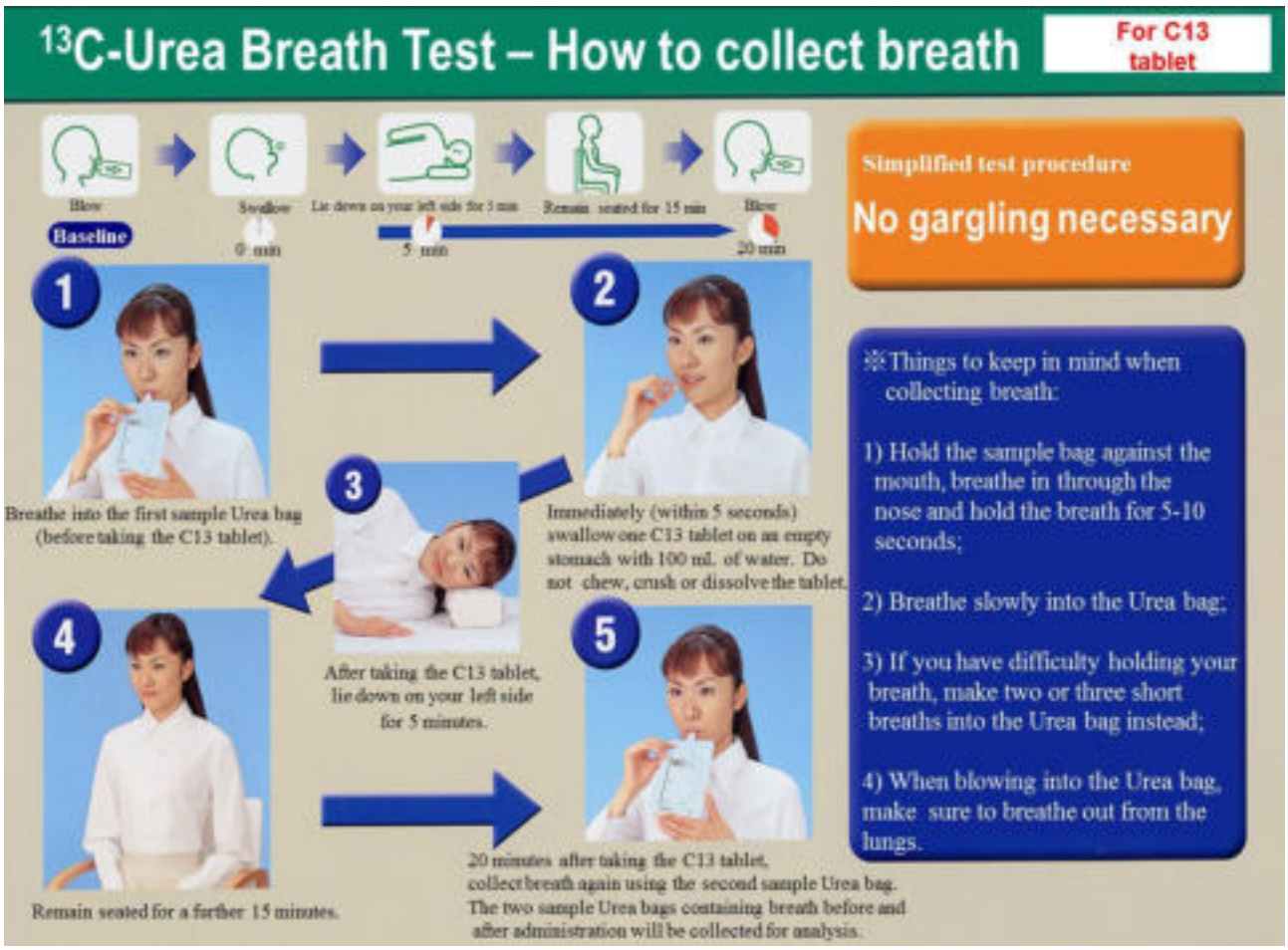


Fig. 6.5 13C respiratory urease test

or the determination of H. pylori antigen in the feces, and with simultaneous EGDS- using a rapid urease test.

Level of credibility of recommendations C (level of reliability of evidence-4)

Comments: In accordance with the recommendations of the Maastricht-V conciliation meeting (2016), the most optimal tests for the primary diagnosis of H. pylori infection are the 13C respiratory urease test and the determination of the H. pylori antigen in the feces. Thus, according to the latest Cochrane review and meta-analysis, the sensitivity of the 13C respiratory urease test is 94% (95% CI: 0.89-0.97), and the determination of H. pylori antigen in the feces is 83% (95% CI: 0.73 - 0.90) with a fixed specificity of 90%.

If patients are simultaneously undergoing EGDS, then the method of primary diagnosis can be a quick urease test. When using endoscopic methods for the diagnosis of N. pylori, at least 2 biopsies from the body of the stomach and 1 biopsy from the antrum are taken. The serological method for detecting antibodies to H.

pylori can be used for the primary diagnosis of H. pylori infection, however, only if the detected antibodies belong to the IgG class. The microbiological (bacteriological) method is currently used to determine the individual sensitivity of H. pylori to antibiotics in cases of ineffective treatment.

To control the eradication, which is carried out 4-6 weeks after the end of eradication therapy, it is best to use a 13C-urease respiratory test or determination of the H. pylori antigen in the feces. In addition, a negative test result for H. pylori infection must be confirmed by another diagnostic method.

In patients with a refractory course of peptic ulcer disease, in order to exclude Zollinger-Ellison syndrome,

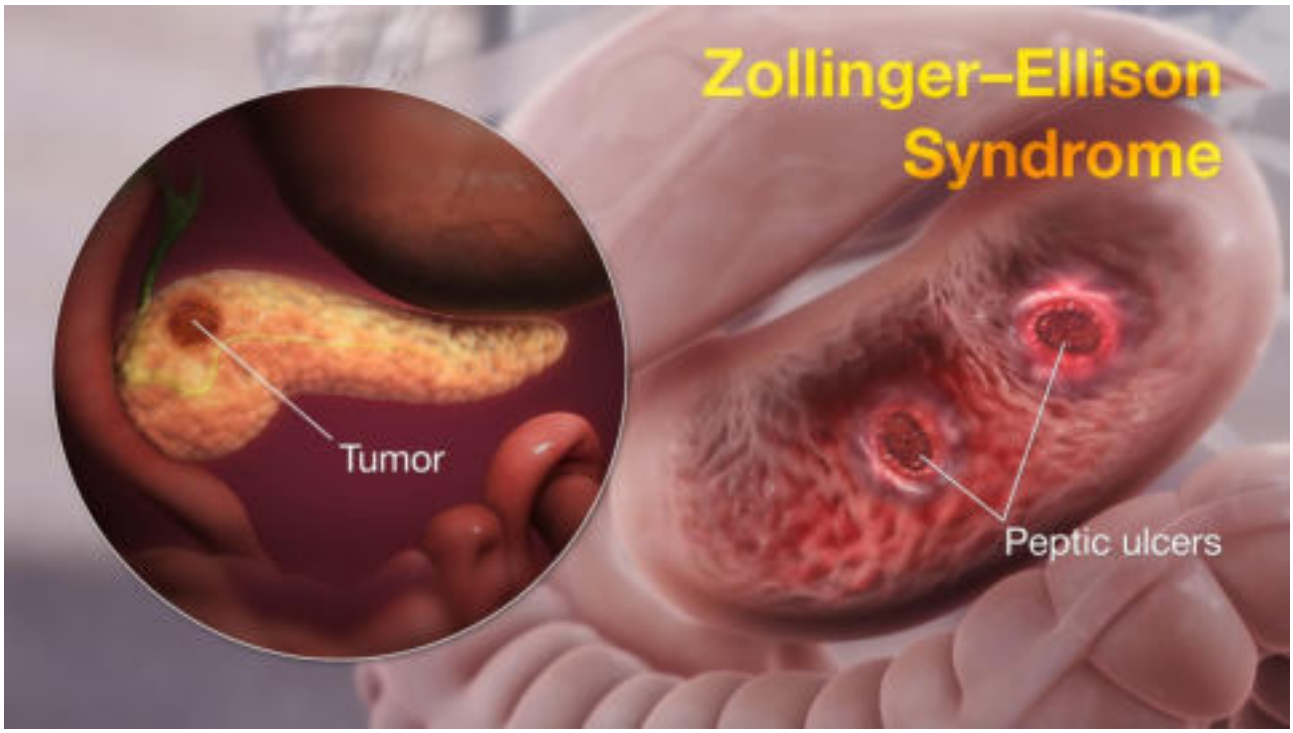


Fig. 6.6. Zollinger-Ellison syndrome

it is recommended to determine the level of serum gastrin.

The level of credibility of recommendations - C (the level of reliability of evidence – 5)

Comments on: The pathogenesis of gastroduodenal ulcers in Zollinger-Ellison syndrome is associated with a sharp hypersecretion of hydrochloric acid as a result of the presence of a gastrin-producing tumor in patients (most often in the pancreas).

These ulcers are usually multiple, localized not only in the stomach and

duodenum, but also in the jejunum, and sometimes in the esophagus, occur with severe pain, persistent diarrhea. When examining such patients, there is a sharply increased level of gastric acid production (especially in basal conditions), an increased content of serum gastrin is determined (3-4 times compared to the norm).

Provocative tests (with secretin, glucagon), ultrasound and CT scans of the pancreas help in the recognition of Zollinger-Ellison syndrome.

7. Treatment

Treatment, including drug and non-drug therapies, diet therapy, pain relief, medical indications and contraindications to the use of treatment methods

Treatment of PUD should be comprehensive and include not only the prescription of medications, but also a wide range of different measures: dietary nutrition, cessation of smoking and alcohol abuse, refusal to take drugs that have an ulcerogenic effect, normalization of the work and rest regime, spa treatment.

Patients with uncomplicated course of PUD are subject to conservative treatment. In most cases, it is performed on an outpatient basis. However, with a pronounced pain syndrome, a high risk of developing complications (for example, large and giant ulcers), the need for further examination to verify the diagnosis (for example, with an unclear nature of gastric ulcer), severe concomitant diseases, it is advisable to hospitalize patients.

Surgical treatment [8-15]

Before providing data from the clinical recommendations, we will give an overview of the methods of surgical intervention.

The amount of preoperative preparation for ulcers depends on the severity of the patient's condition, which is primarily determined by the severity of peritonitis. With a stable general condition of the patient, a short period of the disease, the local nature of the peritoneal reaction, preoperative preparation may not be required. In severe general condition, hemodynamic disorders and toxic or end-stage peritonitis,

preoperative preparation is carried out in the intensive care unit, but its duration, as a rule, does not exceed 4-6 hours.

Surgical aids for ulcers are divided into palliative and radical. Palliative procedures include suturing the ulcer

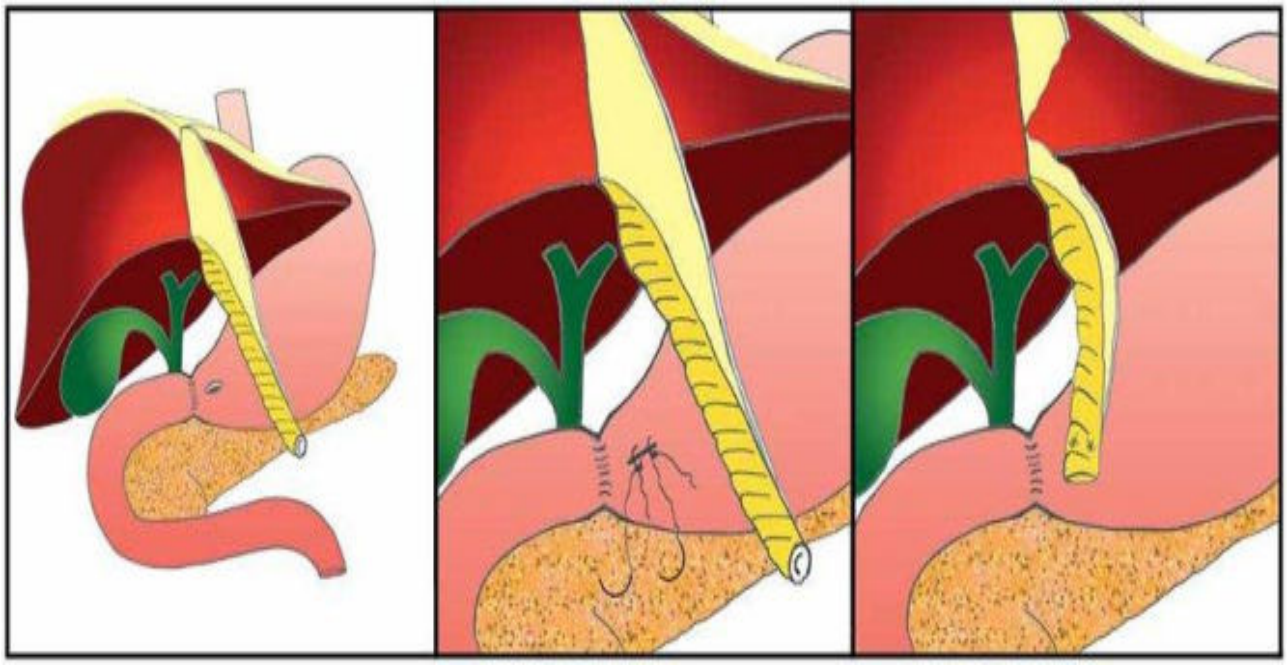


Fig. 7.1 Suturing perforated ulcer

and tamponade of the perforating hole with a large omentum.

Fig. 7.2 Endoscopic ulcer hemostasis

The most commonly performed suturing of the ulcer defect.

The positive aspects of this technique are the technical simplicity, the speed of execution, the ability to perform from the mini-access and laparoscopically. In the latter case, laparoscopic sanitation of the abdominal cavity is also used.

The negative aspects of palliative techniques are the lack of influence on the etiopathogenetic mechanisms of ulceration, a high percentage of relapses, the inability to perform for technical reasons (large size of the ulcer defect). Despite this, a number of clinics consider ulcer suturing to be the operation of choice, which is associated with the effectiveness of modern anti-ulcer therapy in the postoperative period and the possibility of performing this operation using minimally invasive methods. Radical operations in perforated ulcers, in addition to removing the ulcer defect, affect the etiopathogenetic mechanism of ulcerogenesis. In accordance with this, most methods of surgical treatment involve a predominant effect on either the neuro-reflex mechanism of secretion (vagotomy), or on the neuro-humoral (gastric resection), or a simultaneous effect on both mechanisms (vagotomy in combination with antrumectomy).

Gastric resection mainly affects the gastric mechanism of regulation of acid production, in addition, this operation removes part of the stomach along with the ulcer. In this case, part of the acid-producing zone is removed and most of the nerves that go to other organs are crossed. Taking into account the fact that the gastrin-producing zone is located in the antrum and along a small curvature, the classical scheme of gastric resection provides for the removal of at least 2/3 of the organ. Gastric resection is much more traumatic than vagotomy, but its advantage in gastric ulcer is the possibility of wide excision of the ulcer with the surrounding tissues. The frequency of malignancy of stomach ulcers reaches 10%, and before the operation and during its execution, this complication can not always be detected. Therefore, gastric resection remains the main operation in the treatment of patients with gastric ulceration localization. Currently, three main types of gastric resection are used.

Gastric resection according to Billroth-I

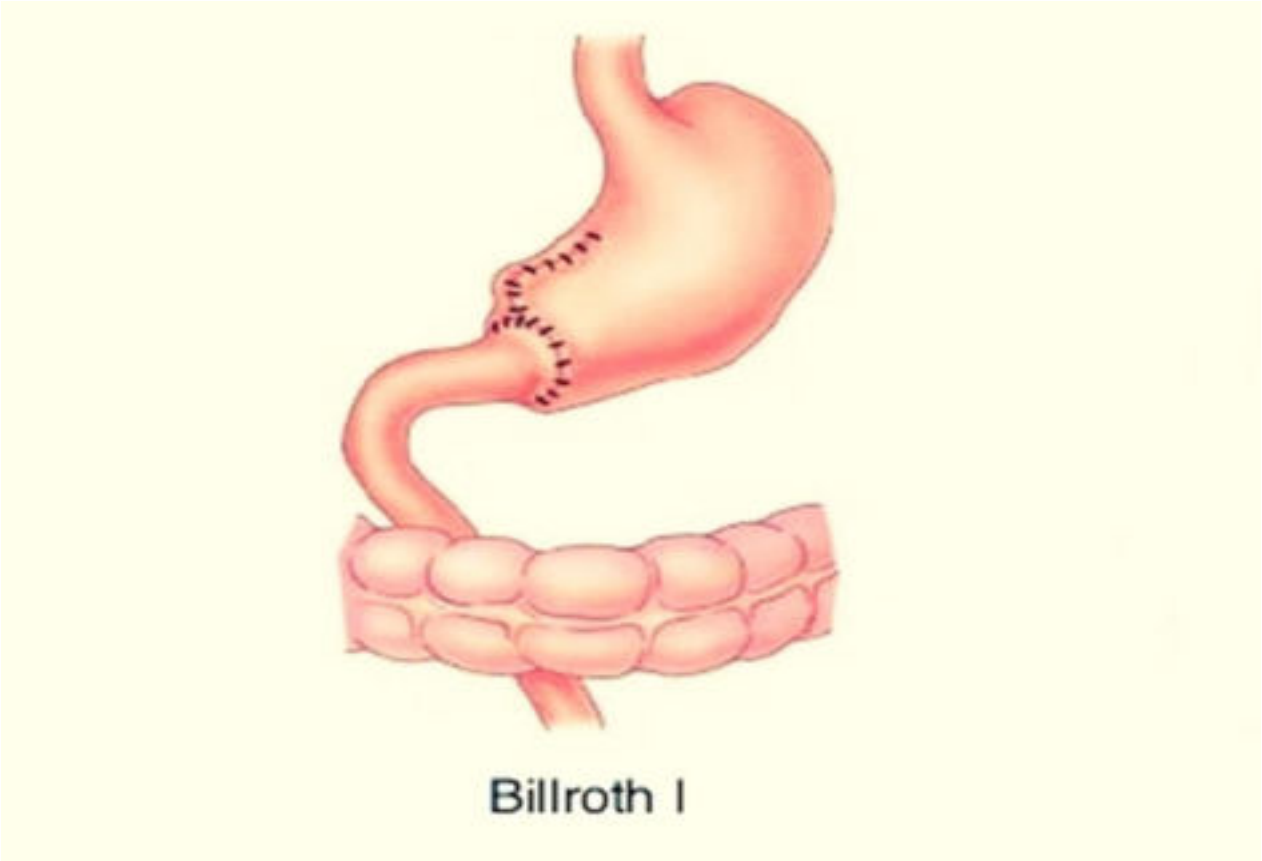


Fig. 7.3 Billroth I

involves the removal of 2/3 of the stomach together with the pylorus and the imposition of gastroduodenoanastomosis. Stomach resection according to Billroth-II in the Hofmeister-Finsterer modification also provides for the removal of 2/3 of the stomach and the pylorus, suturing of the duodenal stump and the imposition of a gastrojunoanastomosis with a short or long adductor loop of the small intestine and a number of measures to prevent the accelerated evacuation of food from the stomach stump and throwing food into the adductor loop. The advantage of the Billroth-II

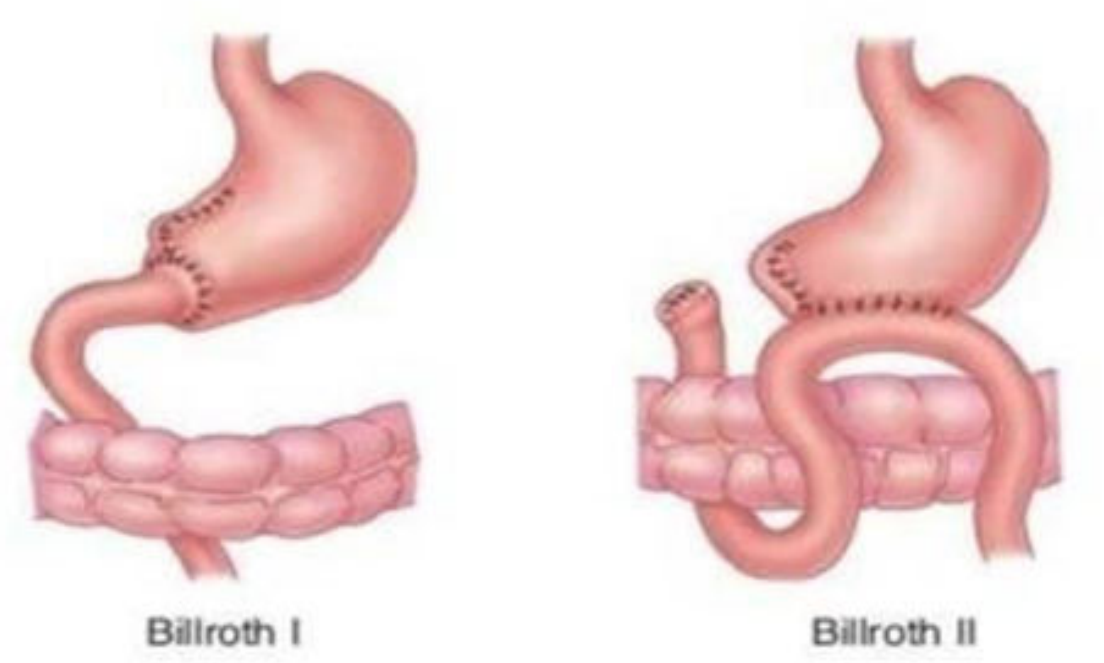


Fig. 7.4 Billroth II

operation is the ability to perform a more extensive resection. The third main type of this operation, which has recently become increasingly widespread, is pylorus-preserving resection of the stomach. This operation is performed only with a perforated stomach ulcer. The meaning of the intervention is to remove 2/3 of the organ together with the ulcer, a significant part of the antrum, a small curvature and part of the acid-producing zone, while preserving the pylorus and a small part of the antrum. The operation fails with an overlay of gastroretentive. In order to avoid denervation of the remaining organs, some surgeons preserve both the Laterus nerves and the ventral trunk, which extends to the solar plexus. With gastric ulcer, this operation is quite radical and gives good long-term results.

In the treatment of a perforated ulcer of the duodenum, organ - preserving operations-vagotomies-have become widespread. These operations include interventions on the ulcer defect and the vagus nerve.

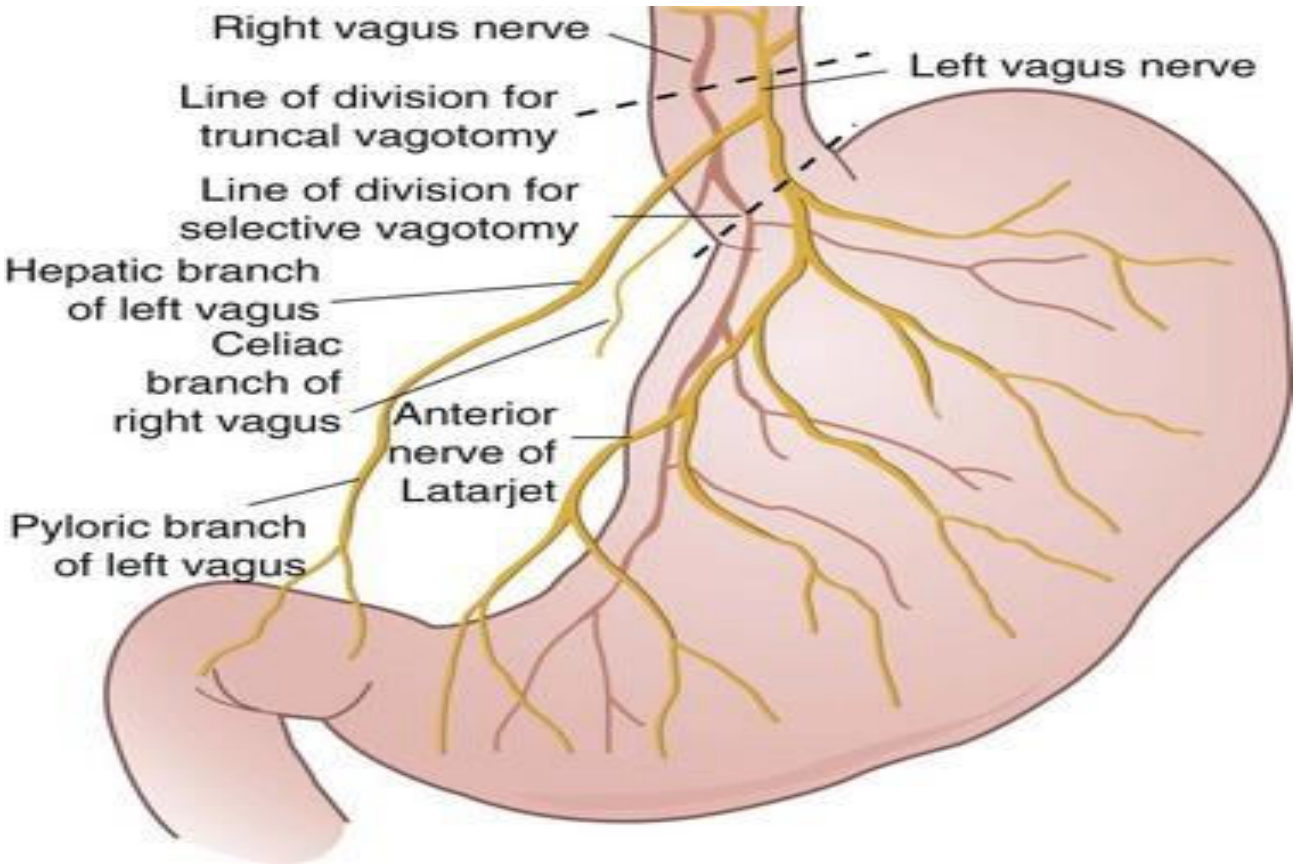


Fig. 7.5 The vagus nerve

The vagus nerves provide parasympathetic innervation of the stomach. The anterior (right) vagus nerve passes in loose fiber along the anterior surface of the esophagus, from it the hepatic branches, branches to the bottom and body of the stomach and the anterior gastric nerve (n. Laterge) depart. The latter runs along a small curvature, innervating the antrum and the pylorus. The posterior (left) vagus nerve passes retroperitoneal behind the esophagus and is involved in the formation of the ventral plexus.

The anatomical features of the vagus nerves determine the technical options for vagotomy. Given that hypersecretion plays a major role in the occurrence of duodenal ulcers and the latter practically do not malignize, this group of operations is used only for the treatment of patients with localization of the ulcerative process in the duodenum. In principle, there are different types of vagotomy.

Stem vagotomy (STV)

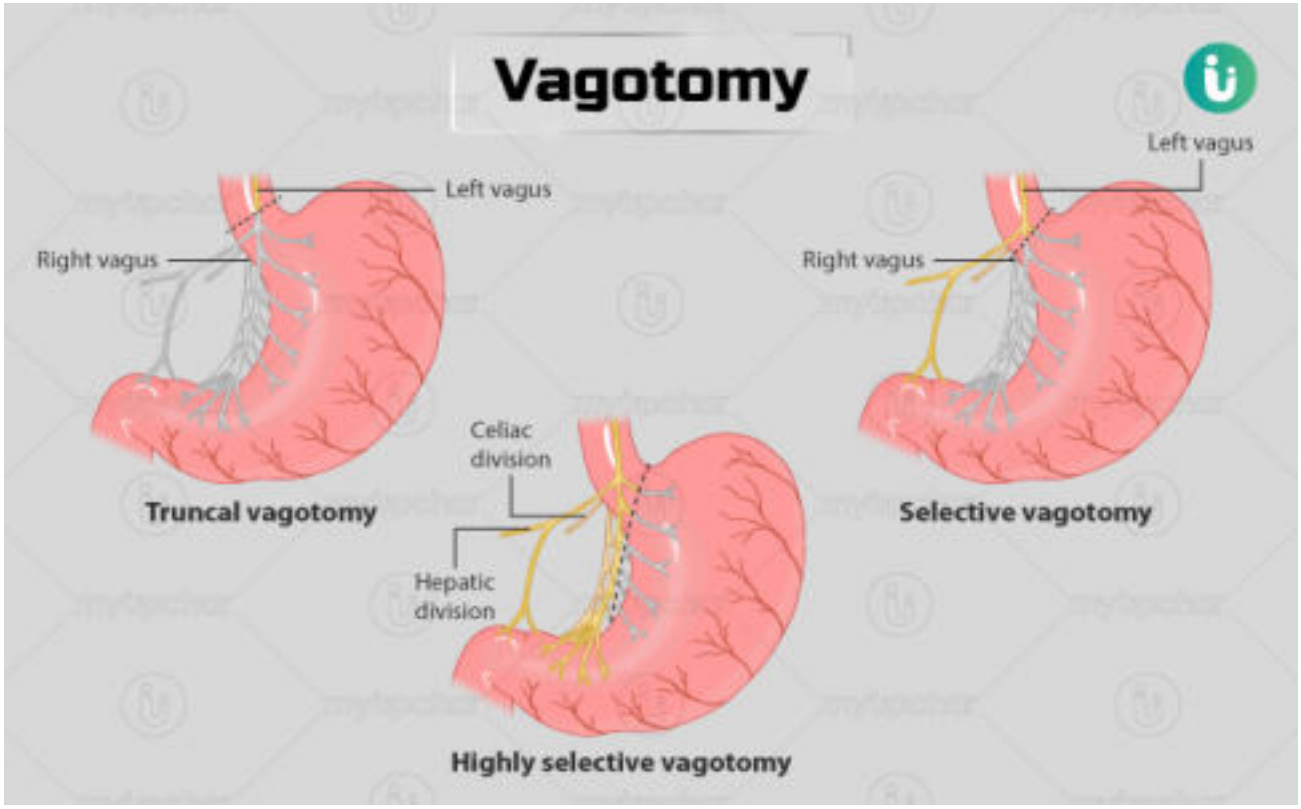
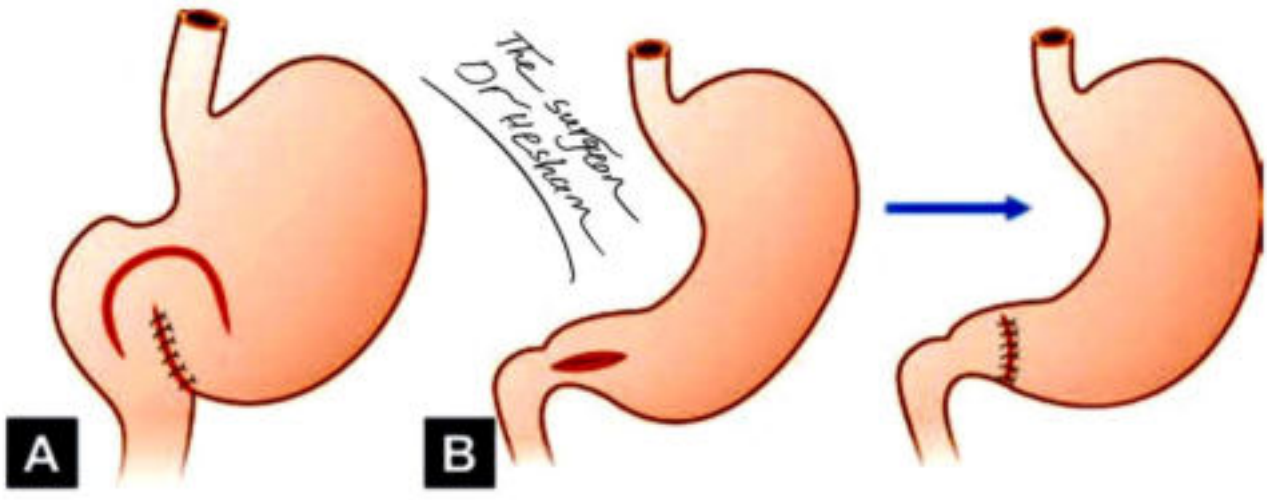


Fig. 7.6Three standards variants of vagotomy

involves the intersection of both trunks of the vagus nerves at the level of the abdominal esophagus with denervation of the entire stomach and abdominal organs. In order to avoid subsequent gastrostasis caused by denervation of the antar part of the stomach, stem vagotomy is supplemented with gastric drainage operations: Judd

Fig. 7.7Judd pyloroplasty

or Finney pyloroplasty,



Figs 20.98A and B: Types of pyloroplasty. (A) Finney's pyloroplasty, (B) Heineke-Mikulicz pyloroplasty.

Fig. 7.8Finney pyloroplasty

which are performed after excision of the edges of the perforated ulcer of the duodenum.

Judd's pyloroplasty consists of a longitudinal (to the axis of the stomach)dissection of the pylorus and the initial section of the duodenum, followed by suturing in the transverse direction. Pyloroplasty according to Finney involves dissection of the initial part of the duodenum, the pylorus and the prepiloric part of the stomach with a U-shaped incision, followed by suturing according to the type of anastomosis "side to side". In this case, the ulcer defect on the front wall of the duodenum, as a rule, is excised. Other drainage interventions are performed less frequently.

The main advantage of STV is the technical simplicity of execution and a small trauma, the disadvantages are the destruction of the pyloric mechanism and the violation of the parasympathetic innervation of the abdominal organs.

Selective vagotomy (SV) involves the selective intersection of the nerve stems of the vagus nerves that approach the stomach with the preservation of the remaining branches. This operation did not receive much distribution. Technically, it is difficult to isolate and cross all the gastric branches that depart from the vagus nerves, the operation is much more traumatic than STV, and also requires simultaneous intervention that drains the stomach.

Selective proximal vagotomy (SPV) aims at vagal denervation of only the acid

–

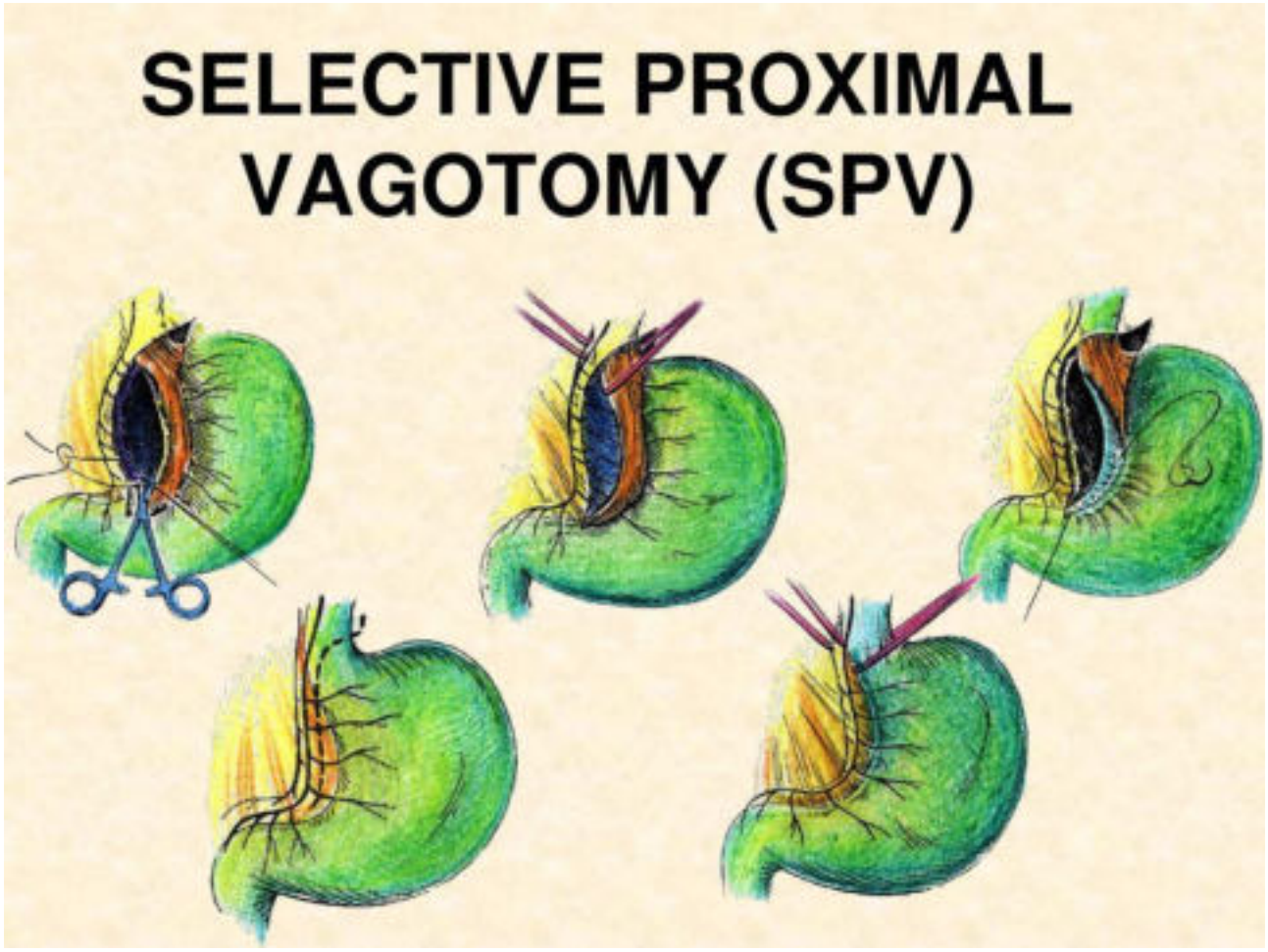


Fig. 7.9Selective proximal vagotomy (SPV)

producing parts of the stomach - the bottom and body-while preserving the innervation of the antral part of the stomach and other organs. It is performed by parietal crossing of the nerves, simultaneously with the vessels along the small curvature of the stomach with the preservation of both nerves Laterally. The greatest completeness of the vagotomy is achieved due to the additional intersection of the nerves and vessels along the large curvature in the same way (SPV in the modification M,And,Cousin).

In the clinic of surgical diseases of the Central Clinical Hospital No. 1. Yekaterinburg has developed a new original technique for performing vagotomy-cryovagodenervation of branches of the vagus nerve innervating acid-producing zones. The technique is characterized by low trauma, simplicity, speed of execution and good immediate and long-term results.

In addition to excision of the edges of the ulcer with subsequent pyloroplasty during organ-preserving operations, in some cases it is possible to perform duodenoplasty without dissecting the pyloric pulp. Now let's move on to the clinical recommendations.

Patients with complicated forms of gastric and duodenal ulcer (bleeding, perforation, penetration, malignancy and decompensated stage of scar stenosis) are recommended to be hospitalized for surgical treatment in a surgical hospital.

Level of credibility of recommendations C (level of reliability of evidence – 5)

Comments: Patients suffering from a complicated course of peptic ulcer disease, as a rule, need to be hospitalized in an emergency. Treatment of ulcerative bleeding is advisable to start in the intensive care unit, as well as treatment for decompensation of chronic diseases in combination with other complications of peptic ulcer disease. The main task of treatment in the intensive care unit is to stabilize the patient's condition – to replenish the volume of circulating blood, to combat the manifestations of hypovolemic shock, adequate anesthesia, treatment of decompensated concomitant diseases and systemic inflammatory reaction syndrome, after which surgical and/or endoscopic methods of treatment can be applied.

It is important to note that in ulcerative bleeding, the risk of death of a comorbid patient directly correlates with the number of concomitant diseases. This, in turn, requires the doctor to be very careful when working with comorbid patients and to analyze all risk factors for the development of complications of peptic ulcer disease until their implementation.

In patients with ulcerative bleeding, esophagogastroduodenoscopy is recommended to be performed in the first 2 hours after hospitalization in order to verify the source of bleeding and perform endoscopic hemostasis.

Level of credibility of recommendations C (level of reliability of evidence – 5)

In patients with ulcerative bleeding, repeated esophagogastroduodenoscopy to verify the source of bleeding and perform endoscopic hemostasis is recommended only in cases of recurrent bleeding and in cases of high risk of its development.

Level of credibility of recommendations A (level of reliability of evidence-1)

Comments: A number of studies confirm that performing therapeutic endoscopy to stop ulcerative bleeding significantly reduces mortality, the need for surgery, the risk of recurrent bleeding, as well as the time of continuing bleeding in comparison with pharmacotherapy. According to the systematic review of B. J. Elmunzer et al., risk factors of recurrent bleeding are: large ulcer size (more than 1 cm in diameter), location of the ulcer on the lesser curvature of the stomach and on the back wall of the duodenum, and unstable hemodynamics – blood pressure lowering during bleeding with subsequent increase of the background fill of circulating blood volume. It is also important to note that taking anticoagulants and disaggregants significantly increases the risk of ulcerative bleeding, including repeated bleeding, as well as a sharp increase in blood pressure (for example, as a reaction to pain or due to a missed dose of an antihypertensive drug). Routine repeated EGDS in patients with a low risk of recurrent bleeding does not affect the frequency of recurrent bleeding and is not economically feasible.

In patients with ulcerative bleeding, emergency surgical intervention to verify the source of bleeding and stop it is recommended to perform at the earliest possible time if endoscopic hemostasis is ineffective.

The level of credibility of recommendations C (the level of reliability of evidence-2).

Comments: Surgical treatment of ulcerative bleeding is indicated when it is not possible to control it endoscopically-with continued bleeding or with a relapse. Untimely surgical treatment worsens the prognosis for the patient and increases mortality. The operation is necessary to achieve reliable hemostasis and reduce the risk of recurrent bleeding. The volume of the proposed operation depends on the patient's condition, but it is important to remember that the surgical intervention should be as gentle as possible. In patients with a high risk of surgical intervention, it is preferable to perform X-ray endovascular selective angiography with subsequent occlusion of the bleeding vessel.

According to foreign recommendations, it is most preferable to perform a gastrotomy (pyloroduodenotomy) with stitching of a bleeding vessel and suturing of an ulcer defect, but this method is inferior in its reliability to resection operations.

The best result in the treatment of refractory complicated ulcers was observed in the combination of gastric resection with gastrojunoanastomosis according to Roux and vagotomy, however, in the foreign literature, vagotomy is considered as a complex, limited applicable option, for the full recognition of which high-level evidence studies must be conducted.

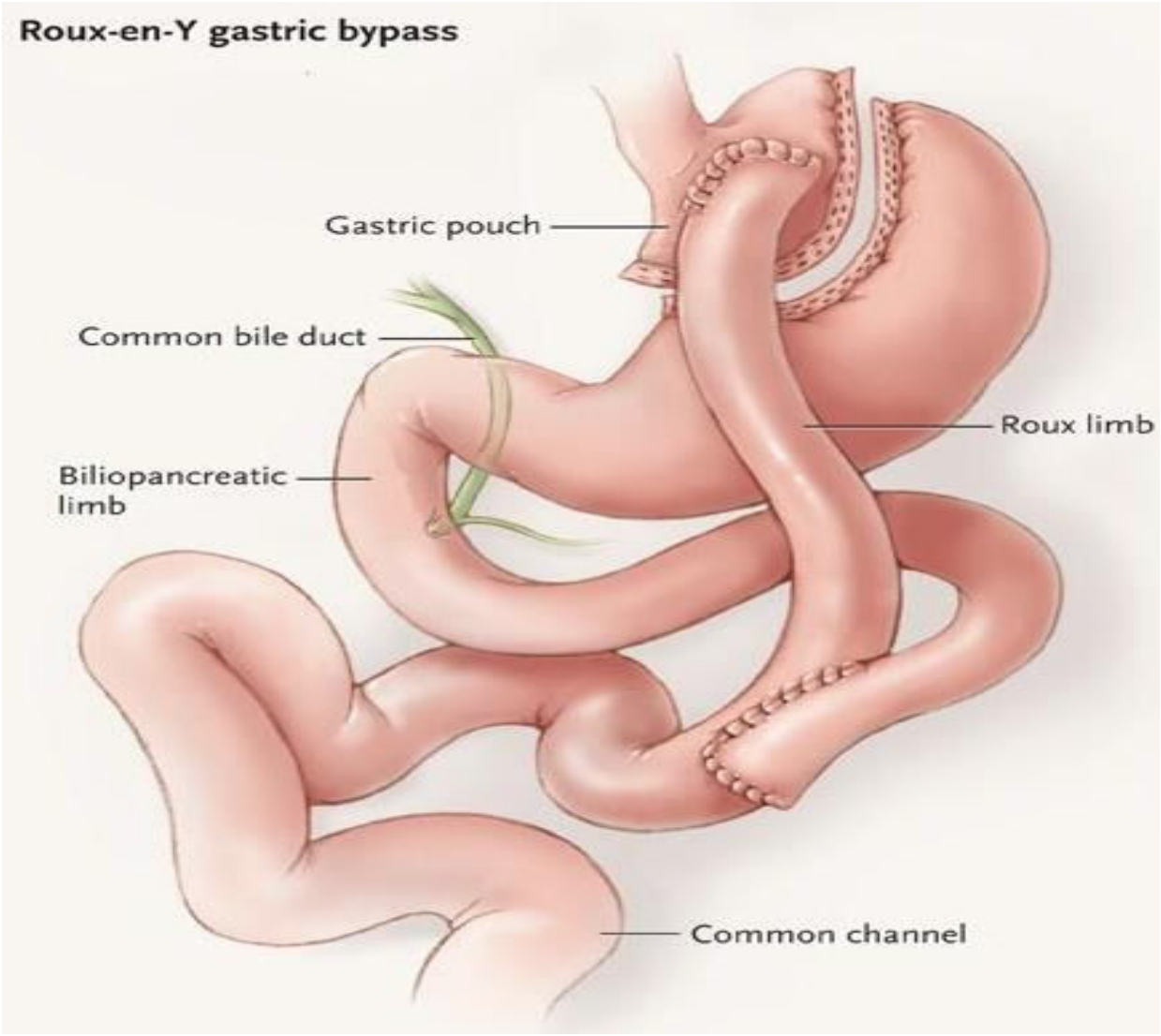


Fig.7.10. Gastrojunoanastomosis according to Roux

The Russian scientific surgical community, on the contrary, recommends performing a vagotomy.

Patients with perforation of gastric and/or duodenal ulcers are recommended to undergo emergency surgery to eliminate the perforation.

Level of credibility of recommendations B (level of reliability of evidence-3

Comments: Ulcer perforation

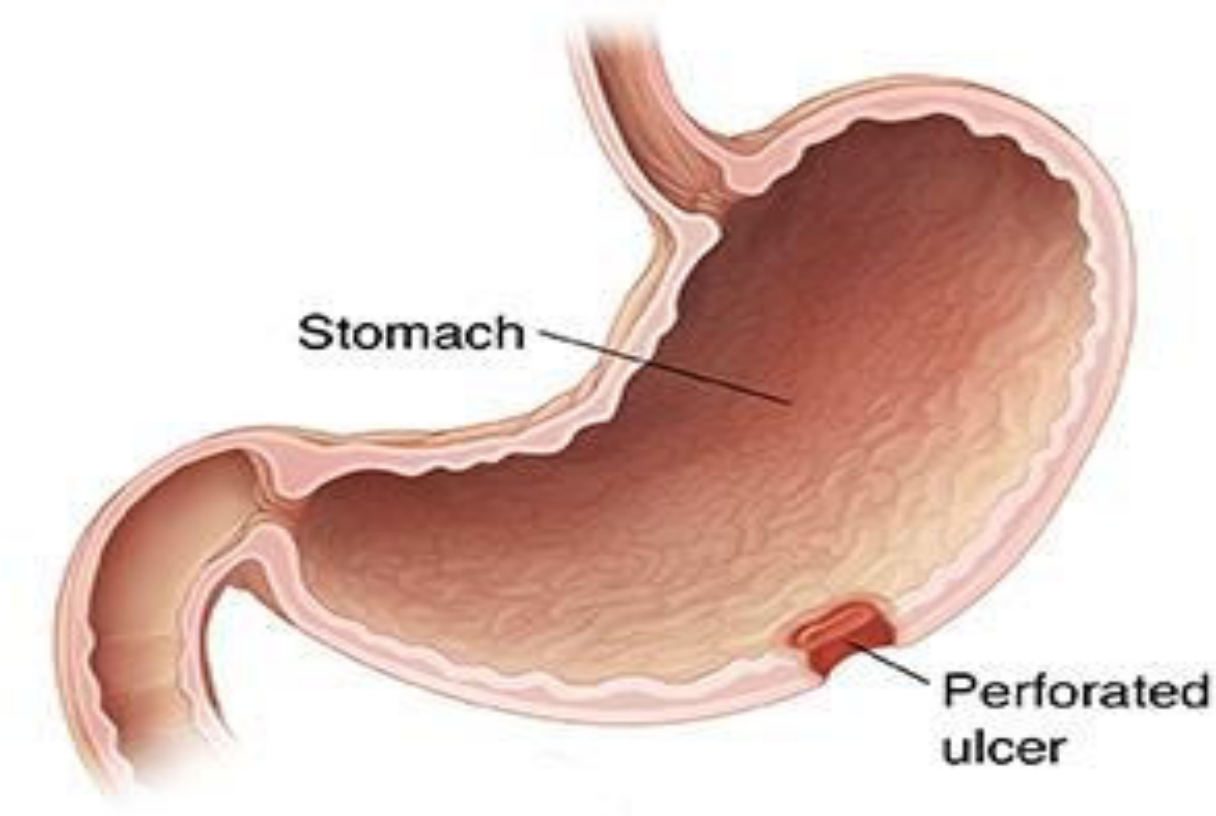


Fig. 7.11 Ulcer perforation

is a common complication that inevitably leads to the development of peritonitis and has a high mortality rate among patients, reaching 30%. The highest mortality is observed among elderly patients, and the highest mortality is observed in the group of patients with late hospitalization (more than 24 hours from the onset of the disease). Laparotomic access has no advantages over laparoscopic access. It is preferable to perform laparoscopic intervention-suturing of the perforating hole with sanitation and drainage of the abdominal cavity. However, the clinical picture of the course of such a formidable complication can be very diverse, and experts recognize that the volume of the operation depends primarily on the patient's condition. The Russian clinical guidelines for the treatment of perforated ulcers provide a more detailed description of surgical treatment options.

Patients with peptic ulcer disease after surgical treatment are recommended to perform testing for H. pylori infection and conduct eradication and maintenance therapy in order to prevent relapses of PUD and its complications.

Level of credibility of recommendations A (level of reliability of evidence-1)

Comments: The completed stage of surgical treatment does not reduce the risk of developing a new round of surgical complications of peptic ulcer disease, primarily bleeding, so it is important to continue the course of conservative treatment of the disease until the patient is completely cured.

Patients with a negative test result for the presence of H. pylori, performed after emergency interventions, in order to exclude its false negative nature, it is advisable to conduct repeated testing on a planned basis - by another method.

Level of credibility of recommendations A (level of reliability of evidence-1)

Comments: To reduce the risk of repeated ulcerative bleeding, it is necessary to achieve persistent eradication of H. pylori. Studies have shown that the proportion of false-negative results in acute ulcerative bleeding reaches 25-55%, and therefore additional tests are necessary to reliably exclude H. pylori infection.

Endoscopic balloon dilatation is recommended for patients with pyloroduodenal stenosis in order to eliminate it. If it is ineffective, it is recommended to perform pyloroplasty and drainage operations.

Level of credibility of recommendations C (level of reliability of evidence – 5)

Comments: Indications for surgical treatment of patients with pyloroduodenal stenosis are determined by the degree of its compensation, as well as the condition of the patients.

8. Control questions

1. The etiology of peptic ulcer disease.
2. Pathogenesis of gastric ulcer.
3. Pathogenesis of duodenal ulcer.
4. Indications for surgical treatment of PUD.
5. Gastric resection in the treatment of PUD.
6. Vagotomy in the treatment of gastroduodenal ulcers.
7. Early postoperative complications.

Tests for self-monitoring of students ' preparation for the lesson:

9. Tests

1. Which of the following symptoms are characteristic of a bleeding gastroduodenal ulcer? a) increased abdominal pain; b) no pain during this period; c) feces of the type of "raspberry jelly"; d) vomiting of "coffee grounds"; e) melena. Choose the correct combination of answers:

1. a, b, c;

2. b, c, d;

3. b, d, e;

4. a, d, e;

5. c, d, e.

2. Which of the following factors is not an aggressive factor in the pathogenesis of peptic ulcer disease?

1. hydrochloric acid;

2. pepsin;

3**. Helicobacter pylori;**

4. non-steroidal anti-inflammatory drugs;

5. bicarbonates.

3. Mandatory methods of clinical examination of patients with peptic ulcer disease are: a) x-ray; b) EGDFS; c) study of gastric secretion; d) ionomanometry; e) ultrasound; f) CT; g) study for Helicobacter pylori. Choose the correct combination of answers:

1. a, b, g;

2. a, b, c;

3. b, c, d;

4. c, d, e;

5. e, f, g.

4. The Mondor triad for perforated ulcers includes: a) ulcerative anamnesis; b) free gas on the overview x-ray image; c) "plank-shaped" abdomen; d) disappearance of

hepatic dullness with percussion; e) "dagger" pain. Choose the correct combination of answers:

1. a, b, c;

2. a, b, e;

3. c, d, e;

4. b, d, ee;

5. b, c, d.

5. A young man was admitted to the emergency department with complaints of severe abdominal pain. Suffers from peptic ulcer disease for several years. Blood pressure-90/60 mm Hg, pulse-100 beats per 1 min, anuria. Palpation: the anterior abdominal wall is sharply tense. The diagnosis is likely to be based on:

1. count of white blood cells in the peripheral blood;

2. overview radiography of the abdominal cavity in the standing position;

3. ESR levels;

4. contrast radiography of the stomach;

5. contrast X-ray examination of the colon.

6. After a thorough clinical examination, the patient was diagnosed with Zollinger-Ellisson syndrome. Which of the statements can be considered true in relation to this syndrome?

1. this syndrome is a postoperative complication of surgical interventions for peptic ulcer disease and leads to persistent vomiting after eating;

2. this syndrome is also known as superior mesenteric artery syndrome;

3. this syndrome consists in a violation of the patency of the distal parts of the stomach, due to ulcerative deformity;

4. this is a form of severe peptic ulcer disease caused by a gastrin-producing tumor of the pancreas;

5. it is found in psychiatric practice in patients who often swallow foreign bodies.

7. In what cases is it necessary to examine the level of gastrin in patients with peptic ulcer? a) with multiple ulcers; b) with a relapse of the ulcer after surgical treatment;

c) with basal hypochlorhydria; d) with a long-term non-healing ulcer; e) with basal hyperchlorhydria. Choose the correct combination of answers:

1. a, b, c;

2. a, b, d;

3. b, c, d;

4. a, b, e;

5. b, d, e.

8. The patient has decompensated stenosis of the pylori-bulbar region against the background of a 10-year ulcerative history. In a moderate condition, he was admitted with complaints of repeated vomiting and belching rotten. Notes a pronounced weakness. Exhausted. After the stabilization of the metabolic parameters and the general condition, the patient agreed to surgical treatment. Upon further examination, it was revealed that the patient is a hyposecretor, there are endoscopic signs of pronounced gastritis in all parts of the stomach. Select the operation method:

1. selective proximal vagotomy;

2. vagotomy with gastric drainage surgery;

3. stomach resection according to Billroth II;

4. the imposition of gastrostomy by Witzel;

5. Nissen fundoplication.

9. Which of the following is most preferable for a young patient with a perforated duodenal ulcer in the absence of a previous ulcerative anamnesis and other complications inherent in peptic ulcer disease?

1. The Wangensteen-Taylor method;

2. vagotomy with gastric drainage surgery;

3. stomach resection;

4. laparoscopic suturing of a perforated ulcer;

5. traditional suturing of a perforated ulcer.

10. Choose the most common cause of ulcer recurrence after organ-preserving surgery with vagotomy, with an adequate reduction in acid production after surgery:

1. Zollinger-Ellison syndrome;

2. incomplete vagotomy;

3. duodenogastric reflux of bile;

4. gastritis of the operated stomach;

5. excessive consumption of alcohol.

11. A 75-year-old woman was admitted with a picture of spilled peritonitis 3 days ago. Long-term ulcerative history. A review X-ray of the abdominal cavity revealed a "free gas". This patient is shown:

1. endoscopic esophagogastroduodenoscopy;

2. stomach X-ray with barium;

3. emergency laparotomy;

4. observation;

5. Ultrasound.

12. A patient who underwent resection surgery for peptic ulcer disease had a relapse (according to EGDS data). What is the cause of the relapse? a) Zollinger-Ellison syndrome; b) incomplete vagotomy; c) part of the antrum left during resection; d) economical stomach resection; e) violation of the diet. Choose the correct combination of answers:

1. a, b, c;

2. c, d, e;

3. b, c, d;

4. a, c, d;

5. b, c, e.

13. A patient who underwent subtotal gastric resection for peptic ulcer disease developed dumping syndrome. What of the following can be found out when analyzing the complaints of this patient, which would accurately characterize this syndrome? a) it causes a feeling of fullness in the epigastric region and vomiting; b) it causes nausea, dizziness and palpitations; c) it begins due to rapid emptying of the stomach, leading to overstretching of the jejunum with accumulated fluid; d) it can be stopped by following an appropriate diet. Choose the correct combination of answers:

1. all answers are correct;

2. a, b;

3. b, c;

4. c, d;

5. d.

14. What statements about adductor loop syndrome can be considered true? a) a manifestation of his are nausea, feeling of heaviness and pain in the epigastric region, resolving after vomiting with bile without impurity of food; b) is common in patients undergoing gastric resection according to Billroth type I; c) treatment is to achieve adequate drainage leading loops, typically by means of reconstruction gastrojejunostomy in the anastomosis after Roux; d) syndrome is difficult to treat and often recur after surgical reconstruction. Choose the correct combination of answers:

1. a, b;

2. b, c;

3. c, d;

4. a, c;

5. b, d.

15.On the 9th day of the patient after vagotomy with pyloroplasty according to Finney, the adequacy of the motor and evacuation functions of the stomach was checked. As a result, a delay in the evacuation of gastric contents was diagnosed. What routine method of the following could lead to the assumption of this complication before the X-ray examination?

1. probe samples;

2. a detailed clinical analysis of blood;

3. endoscopic gastroduodenoscopy;

4. barium enema;

5. NMR-tomography of the upper floor of the abdominal cavity.

16. A 55-year-old man was admitted to the hospital with complaints of vomiting food for a week. Long-term ulcerative history. In the last year and a half - frequent vomiting of food eaten the day before. Weight loss by 20 kg. The hematocrit is 55%. What treatment is inappropriate?

1. performing esophagogastroduodenoscopy with a probe into the small intestine for enteral nutrition;

2. regular gastric lavage;

3. central vein catheterization;

4. administration of metoclopramide to stimulate the evacuation function of the stomach;

5. administration of H2-blockers intravenously.

17. A 48-year-old patient has a combined form of peptic ulcer disease (pronounced cicatricial deformity of the duodenal bulb with subcompensatedpylorobulbar stenosis and chronic gastric angle ulcer). What operation is indicated for the patient?

1. stomach resection;

2. selective proximal vagotomy;

3. stem vagotomy with pyloroplasty;

4. gastroenterostomy;

5. vagotomy with hemigastrectomy.

18. Isolated selective proximal vagotomy is not indicated for the following conditions: a) prepiloric gastric ulcer; b) mediogastric gastric ulcer; c) chronic duodenal ulcer; d) duodenal ulcer complicated by compensated stenosis; e) duodenal ulcer complicated by subcompensated stenosis. Choose the correct combination of answers:

1. a, b, c;

2. a, b, d, e;

3. b, c, d, e;

4. c, e;

5. b, c, d.

19. What methods of determining gastric secretion of hydrochloric acid should be used before planning a vagotomy operation? a) aspiration of gastric contents with a thin probe using stimuli (cabbage, caffeine); b) aspiration of gastric contents with a thick probe and the use of the same stimuli; c) intragastric daily pH-metry; d) pH-

metry; e) aspiration of gastric contents with a thin probe using parenteral stimuli. Choose the correct combination of answers:

1. a, b;

2. c, e;

3. b, d;

4. d, e;

5. b, e.

20. In a 48-year-old patient with a giant stomach ulcer with a recurrent course (he has been suffering from peptic ulcer disease for 11 years) identified histaminorefracter achlorhydria. What is the treatment strategy?

1. inpatient conservative treatment for 8 weeks and discharge of the patient;

2. inpatient treatment until the ulcer heals and the patient is discharged;

3. conservative treatment in the hospital and subsequent spa treatment;

4. anti-ulcer therapy before elective surgery as part of preoperative preparation;

5. emergency operation.

10. Situational tasks

1. The patient, 36 years old, has been suffering from stomach ulcers for 12 years with almost annual exacerbations. He is treated regularly in a polyclinic, has been to resorts several times, and carefully follows a diet. I have never been in a therapeutic hospital. The ulcer is always traced during X-ray examination.

Should the patient be offered surgery?

2. The patient, 34 years old, 6 years ago had a perforation of a silent ulcer of the 12-duodenum. For two years after that, the patient felt well and did not go anywhere. Then there were pains characteristic of peptic ulcer disease, and an X-ray examination revealed the presence of a 12-duodenal ulcer. The patient was treated all the time only on an outpatient basis. He was admitted to the surgical hospital for suspected ulcerative bleeding, the presence of which turned out to be doubtful.

Is the patient subject to surgical treatment?

3. The patient, 42 years old, has a stomach ulcer for 10 years. After treatment in the hospital, remissions occurred, lasting 1-2-3 years. Three months ago, the patient developed pain in the lumbar region, sometimes of a shingling nature. Otherwise, the course of the disease has not changed. X-ray examination determines a deep niche located along the back wall near the small curvature of the antral part of the stomach.
Why did the nature of the pain change? How is it recommended to treat the patient?
4. A 36-year-old patient was admitted to a surgical clinic with a diagnosis of 12-duodenal ulcer. During the examination, along with an ulcer of the 12 - duodenum, a stomach ulcer was revealed. In the study of gastric secretion, there is a continuous acid formation of high intensity. Taking into account the duration of the disease (10 years) and thelow effectiveness of the annual inpatient conservative therapy, it was decided to operate on the patient.
What operation is indicated for this patient?
5.On the 9th day of the patient after vagotomy with pyloroplasty according to Finney, the adequacy of the motor and evacuation functions of the stomach was checked. As a result, a delay in the evacuation of gastric contents was diagnosed. What routine method of the following research methods could lead to the assumption of this complication before the X-ray examination? a) the sample probe b) a detailed clinical analysis of the blood) endoscopic gastroduodenoscopy d) barium enema d) NMR-tomography of the upper floor of the abdominal cavity
6. A 24-year-old patient was diagnosed with a duodenal ulcer. The ulcer, 4 mm in diameter, is located on the posterior wall of the intestine, immediately behind the pylorus. There is hypersecretion on an empty stomach and after histamine stimulation, with high acidity figures. The motor-evacuation function of the stomach is normal, the exit from the stomach is not narrowed, there is no deformation of the duodenum. The duration of the disease is 6 years, there was bleeding twice. What operation is indicated for the patient? What are the indications for surgery?
7. In a 36-year-old patient, an ulcer of 12 p.c. and a stomach ulcer were found. Suffers from peptic ulcer disease 12 P. K. 9 years. A year ago, there were signs of stenosis of the pylorus. Hypersecretion of the stomach with high acidity levels and a

decrease in motor-evacuation function were found. Stomach ulcer of small size.it is located in the antral region on a small curvature. Specify the cause of the stomach ulcer. What type of operation is indicated for the patient?

8. A patient 18 years old, 2 hours ago, suddenly appeared "dagger" pain in the epigastrium, and then pain throughout the abdomen. Previously, I was worried about heartburn, pain on an empty stomach, at night. The condition of the patient is of moderate severity. The stomach is drawn in, does not participate in breathing. On palpation, there is a sharp soreness throughout the abdomen, a spilled tension of the muscles of the anterior abdominal wall, a positive symptom of Schetkin-Blumberg. Hepatic dullness is smoothed out. Body temperature 36.6 degrees, white blood cells 7100. Make a diagnosis. What are the treatment tactics?

Answers to situational tasks.

1. No, it is necessary to conduct a full-fledged inpatient conservative treatment.
2. No. Conservative inpatient treatment is indicated.
3. The ulcer has penetrated into the pancreas, which is a conditionally absolute indication for surgical treatment.
4. SPV.
5. A.
6. SPV.
7. Selective vagotomy with pyloroplasty.
8. Perforation of the ulcer.

11. References

[1] Søreide, K.; Thorsen, K.; Harrison, E.M.; Bingener, J.; Møller, M.H.; Ohene-Yeboah, M.; Søreide, J.A. Perforated peptic ulcer. Lancet 2015, 386, 1288–1298

[2] Agréus L, Hellström PM, Talley NJ, etal . Towards a healthy stomach? Helicobacter pylori prevalence has dramatically decreased over 23 years in adults in a Swedish community. United European Gastroenterol J 2016;4:686-96. 10.1177/2050640615623369 27733911

[3] Zhang, B.B.; Li, Y.; Liu, X.Q.; Wang, P.J.; Yang, B.; Bian, D.L. Association between vacA genotypes and the risk of duodenal ulcer: A meta-analysis. Mol. Biol. Rep. 2014, 41, 7241–7254

[4] Datta De, D.; Roychoudhury, S. To be or not to be: The host genetic factor and beyond in Helicobacter pylori mediated gastro-duodenal diseases. World J. Gastroenterol. 2015, 21, 2883–2895

[5] Levenstein, S.; Rosenstock, S.; Jacobsen, R.K.; Jorgensen, T. Psychological stress increases risk for peptic ulcer, regardless of Helicobacter pylori infection or use of nonsteroidal anti-inflammatory drugs. Clin. Gastroenterol. Hepatol. 2015, 13, 498–506.e1.

[6] Chung KT, Shelat VG. Perforated peptic ulcer - an update. *World J GastrointestSurg* 2017; 9(1): 1-12URL: https://www.wjgnet.com/1948-9366/full/v9/i1/1.htm

DOI: https://dx.doi.org/10.4240/wjgs.v9.i1.1

[7] Kim HC, Yang DM, Kim SW, Park SJ. Gastrointestinal tract perforation: evaluation of MDCT according to perforation site and elapsed time. *EurRadiol*. 2014;24:1386-1393.

[8] Wright GP, Davis AT, Koehler TJ, Scheeres DE. Cost-efficiency and outcomes in the treatment of perforated peptic ulcer disease: laparoscopic versus open approach. *Surgery*. 2014;156:1003-1007.

[9] Shelat VG, Ahmed S, Chia CL, Cheah YL. Strict Selection Criteria During Surgical Training Ensures Good Outcomes in Laparoscopic Omental Patch Repair (LOPR) for Perforated Peptic Ulcer (PPU). *Int Surg*. 2015;100:370-375.

[10] Di Saverio S, Bassi M, Smerieri N, Masetti M, Ferrara F, Fabbri C, Ansaloni L, Ghersi S, Serenari M, Coccolini F. Diagnosis and treatment of perforated or bleeding peptic ulcers: 2013 WSES position paper. *World J Emerg Surg*. 2014;9:45.

[11] Kim JH, Chin HM, Bae YJ, Jun KH. Risk factors associated with conversion of laparoscopic simple closure in perforated duodenal ulcer. *Int J Surg*. 2015;15:40-44.

[12] Wang YC, Hsieh CH, Lo HC, Su LT. Suturelessonlay omental patch for the

laparoscopic repair of perforated peptic ulcers. *World J Surg*. 2014;38:1917-1921.

[13] Bergström M, Arroyo Vázquez J, Nsouli G, Park PO. [Good results of stent treatment in perforated duodenal ulcer]. *Lakartidningen*. 2015;112.

[14] Wilhelmsen M, Møller MH, Rosenstock S. Surgical complications after open and laparoscopic surgery for perforated peptic ulcer in a nationwide cohort. *Br J Surg*. 2015;102:382-387.

[15] Lee DJ, Ye M, Sun KH, Shelat VG, Koura A. Laparoscopic versus Open Omental Patch Repair for Early Presentation of Perforated Peptic Ulcer: Matched Retrospective Cohort Study. *Surg Res Pract*. 2016;2016:8605039.