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DIAGNOSTIC AND TREATMENT TACTICS OF GASTROESOPHAGEAL REFLUX DISEASE

Monography

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The educational and informational part of the monograph reflects the anatomy and physiology of the esophagus, etiology, pathogenesis, clinical and instrumental diagnostics, classification and clinical picture of gastroesophageal reflux disease. Particular attention is paid to modern diagnostics of this pathology. Approaches based on the use of modern interventions in the treatment of hernias of the esophageal opening of the diaphragm and gastroesophageal reflux disease are presented. Laser radiation is of great importance, which is presented in a separate section. The monograph has a practical focus and helps readers to study the symptoms characteristic of hernias of the esophageal opening of the diaphragm and gastroesophageal reflux disease, to learn the importance of additional examination methods.

The monograph is intended for practicing surgeons, endoscopists, clinical residents and senior students of medical universities.

ISBN

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INTRODUCTION

Relevance and relevance of the dissertation topic. According to ongoing scientific research in Europe and North America, it has been shown that 42% of the population exhibits symptoms of GERD, of which 25-32% require drug therapy, and 10-15% require surgical intervention. The term “gastroesophageal reflux disease” or GERD was first proposed by M. Rossetti. A few years later, in 1999, at the Congress of Gastroenterologists and Endoscopists in Belgium, it was accepted as a separate nosological disease.

Of the classifications based on the results of endoscopic studies, the Los Angeles classification and Savary - Miller classification are most often used in the literature .

According to the data obtained by a number of authors, columnar cell metaplasia of the mucosa transforms into adenogenic cancer. The trigger for its development and transition into a malignant tumor process is the reflux of gastric contents into the esophagus - gastroesophageal reflux. The average population detection rate for Barrett's esophagus ranges from 2.4 to 4%.

Drugs that inhibit acid secretion have mainly helped solve the problem of treating reflux esophagitis. However, drug therapy for GERD aimed at relieving symptoms does not achieve a stable long-term effect in about 30% of patients and does not prevent the development of complications. To solve such an urgent problem, taking into account the clinical experience accumulated over the past decades, it is necessary to develop new ways to improve methods of surgical treatment of hiatal hernias (HH). It is necessary to develop and systematize adequate treatment tactics for differentiated treatment of this category of patients.

The processes of inflammatory changes and degeneration of the esophageal mucosa in GERD have not been sufficiently studied. Thus, according to a number of authors, the frequency of degeneration into adenocarcinoma of the esophagus with dysplasia ranges from 5.0-8.0%.

Clinical manifestations of GERD are based on characteristic complaints and diagnosis does not cause difficulties. However, to identify the stage of change in the

esophageal mucosa, it is necessary to use instrumental research methods, but their choice, sequence of application, and interpretation of data remain controversial.

The issue of performing therapeutic gastrofibroscopy for cylindrical cell degeneration of the esophageal mucosa remains controversial. The current stage is associated with the introduction of minimally invasive surgery, which at this stage has contributed to some correspondence between the idea of “minimally invasive intervention” and “minimal trauma.” As a consequence, this has made it important to improve the level of methods for examining the esophagogastric junction to identify pathological changes in the mucous membrane of the esophagus and decide on further treatment tactics for patients.

All of the above shows the diversity of clinical aspects of GERD, which occurs with pathology of the esophageal mucosa. Solving these questions is one of the conditions for increasing the effectiveness of treatment results for this category of patients.

In recent years, interest in the problem of gastroesophageal reflux disease of the esophagus and hiatal hernia has increased. In terms of frequency, they occupy a leading position among diseases of the digestive tract after cholecystitis of a calculous nature , peptic ulcer of the stomach and duodenum. Hernial hernia in the field of herniology occurs quite often, and also, of all pathologies of the diaphragm reaches up to 87%. The hiatal hernia itself generally does not show any clinical signs and is rarely diagnosed.

The problem of treating GERD with reflux esophagitis is not very difficult: to stop various inflammatory changes in the mucous membrane of the esophagus, it is necessary to eliminate the cause of the development of pathological changes. According to many authors, the use of modern medications gives only a temporary effect, therefore, it becomes obvious that surgery is becoming the main treatment According to the latest data, it has been established that in developed countries the main symptom of the disease is heartburn, which occurs at least 2-3 times a month in about 40% of the population; and in 6-8% it manifests itself daily; of these, 20-

22% of people are forced to use medications to eliminate symptoms. These figures showed us the urgent problem of effective treatment of GERD and its complications.

A unified tactics for surgical treatment of hiatal hernia has not yet been developed. This is associated with dissatisfaction with both immediate and longterm postoperative outcomes (American Society of Gastroenterological Surgeons and European Association of Endoscopic Surgeons (EAES) 2013).

Over the past 30-40 years, numerous methods have been developed for using lasers to treat various surgical pathologies. Reducing the sensitivity of organisms to drugs and the development of allergic reactions has led laser therapy to become an alternative treatment method.

CHAPTER I. DIAGNOSTIC METHODS AND GENERAL PRINCIPLES OF TREATMENT OF GASTROESOPHAGEAL REFLUX DISEASE (Literature Review)

The term “gastroesophageal reflux disease” (GERD), proposed in 1966 by J. Rossetti. This term describes a number of many symptoms and an inflammatory change in the distal part of the esophagus as a result of the constant reflux (regurgitation) of gastric or duodenal contents into the esophagus. We can say that regurgitation of food into the esophagus is a normal physiological state that lasts a few seconds and, in relation to normal esophageal clearance, the esophagus is cleaned. But constant reflux, irregular nutrition and other factors can lead to GERD.

In 1997 at the interdisciplinary congress, in Genvale (Belgium), GERD was recognized as an independent nosological disease . Currently, the term GERD is often used with hiatal hernias (HH).

According to research by many authors, GERD occurs worldwide in an average of 25-40% of the entire population of the planet, many of them do not use any treatment methods, about 18-20% of people are susceptible to self-medication. 15-17% of the population in Southeast and Central Asia experience symptoms of GERD every week. But all this data is relatively incorrect, because not everyone goes to doctors and uses different methods of self-medication.

Etiology and pathogenesis of the development of gastroesophageal reflux disease

According to Sontag S.J. development reflux esophagitis (RE) is divided into three main mechanisms:

1. Congenital defect - developed LES. The antireflux barrier, including the smooth muscle LES, striated muscle diaphragmatic crura, and esophagophrenic membrane, does not form normally due to intrauterine malformation or abnormal pregnancy.

2. Acute injury. The antireflux barrier is disrupted due to acute trauma (damage to the abdomen or chest during a traffic accident, from a blow, from lifting a heavy object). Trauma leads to the development of a hiatal hernia, which renders the antireflux barrier unable to prevent GER.

3. Chronic injury. The antireflux barrier in children and adults gradually weakens over time due to chronic strain during bowel movements and strain in non-physiological conditions (diet low in fiber, sedentary lifestyle). These factors also lead to the development of hiatal hernia with the subsequent occurrence of GERD.

The frequency of detection of Barrett's esophagus ranges from 2.1 to 4% on average in the population. The etiological factors of the disease are: deterioration in quality of life, tobacco smoking, alcohol consumption, various medications that damage the stratified squamous epithelium of the esophagus (in particular, during chemotherapy with cyclophosphamide, 5-fluorouracil), gastroesophageal reflux.

Clinical picture. The clinical picture of GERD depends on the degree of morphological changes, the presence of complications and concomitant diseases. The main symptoms GERD refers to:

- heartburn (70-100%) .
- belching (75-96%),
- pain in the epigastrium and behind the sternum (20-56%),
- regurgitation, dysphagia (17-22%).

And also, when eating, signs of reflex angina (Uden-Ramheld syndrome) and bleeding (especially with hiatal hernia) may be observed. Atypical (nonesophageal) symptoms include:

1. Non-cardiac chest pain.

2. Hoarseness and habitual coughing are also associated with GER (Otolaryngeal symptoms)

3.Recurrent bronchial asthma (Pulmonary symptoms).

According to the clinical manifestations, the symptoms of BE resemble those of GERD (heartburn, pain and discomfort in the chest, regurgitation, dysphagia). However, there are some differences - the disappearance or reduction of discomfort

and heartburn, which is associated with the low sensitivity of the metaplastic epithelium and is considered a “protective function” of epithelial restructuring.

Diagnostic features and latest methods for diagnosing GERD .

X-ray examination of the esophagus remains one of the leading methods for diagnosing GERD , hiatus, although the sensitivity of this research method averages 70-72 %.

X-ray contrast examination of the esophagus and stomach was carried out using the Miratel apparatus of the Italian company General electrics." All patients are examined in vertical, horizontal positions, as well as in the Trendelenburg position. Endoscopic examination is the main and most sensitive method for diagnosing GERD and its complications.

Currently, there are many endoscopic classifications that determine the degree of esophagitis. The most common among them is the classification of esophagitis proposed by M. Savary and G.Miller:

I - diffuse or focal hyperemia of the mucous membrane of the distal esophagus, individual non-confluent erosions spreading from the Z -line upward;

II - merging, but not covering the entire surface of the mucous erosion;

III - merging and covering the entire surface of the mucous erosion;

IV - chronic ulcerative lesions of the esophagus, fibrous stenosis, columnar metaplasia of the esophageal epithelium (Barrett's esophagus).

To identify the diagnosis of PB, the Prague classification (2004) is used, which is based on the maximum length of the circular segment (C) and the maximum length of the flames (M) from the Z -line.

Chromoscopy has several disadvantages:

- For a complete examination, different dyes and nebulizing catheters are needed. and also, some dyes can cause allergic reactions, etc.),
- adding a chromoscopy process lengthens the time of endoscopic examination,

- When spraying the distribution of the dye, they accumulate between the folds, which gives us incomplete information, i.e. After staining, it is sometimes impossible to clearly assess the morphology of different structures of the esophageal mucosa.

Recently, combined methods of endoscopic diagnosis have been used. The development of narrow-spectrum (narrowband) imaging technology began during the period of spectroscopy research. National Project Second Term Comprehensive 10-Years Strategy for Cancer Control was developed in 1994 by Olympus Medical Systems Corp. together with Professor N. Oyama fromTokyo Institute of Technology. They began research with the goal of detailing the color and structure of the mucous membrane to create a more objective (quantitative) assessment of pathological changes, which provides a great diagnostic informative effect.

NBI mode was initially used in the diagnosis of colon tumors and squamous cell carcinoma of the esophagus. Then the areas of use expanded and it is already possible to detect superficial pharyngeal carcinoma, Barrett's esophagus, adenocarcinoma, gastric cancer and inflammatory diseases of the colon. Since 2005, this system has been available to all countries.

The frequency of detection of Barrett's esophagus ranges from 2.1 to 4% on average in the population. The etiological factors of the disease are: deterioration in quality of life, tobacco smoking, alcohol consumption, various medications that damage the stratified squamous epithelium of the esophagus (in particular, during chemotherapy with cyclophosphamide, 5-fluorouracil), gastroesophageal reflux.

Ordinary white light contains all the colors of the spectrum. With white-light endoscopy (WLE), all colors are absorbed onto the surface of the tissue. Therefore, the image remains low-contrast. NBI technology uses only blue (415 nm) and green (540 nm) colors of the spectrum. NBI mode was initially used in the diagnosis of colon tumors and squamous cell carcinoma of the esophagus. Then the areas of use expanded and it is already possible to detect superficial pharyngeal carcinoma, Barrett's esophagus,adenocarcinoma, gastric cancer and inflammatory diseases of the colon. Since 2005, this system has been available to all countries.Ordinary white

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They are very actively absorbed by hemoglobin in blood vessels. With the help of blue light, capillaries can be visualized and it enhances the surface relief of the mucous membrane. And the green light will help you see the architectonics of the venules. Intraesophageal pH-metry is another very reliable method for diagnosing GER B. According to various authors, the sensitivity of this method ranges from 60 to 98%. PH-metry makes it possible to determine the degree of acidity of stomach contents entering the esophagus, the height and frequency of the disease.

Modern methods of treatment of GERD complicated by pathological conditions of the esophageal mucosa

Treatment of GERD and BE is aimed at relieving the symptoms of GERD and reducing the risk of developing various complications. Therefore, treatment is carried out in several directions: conservative, endoscopic therapy and surgical treatment.

I. Conservative therapy. Basic m components medication but treatments include:

- Antacids (Maalox, Almagel, etc.),
- H2-histamine blockers (Ranitidine, Famotidine, Kvamatel, etc.),
- PPI (Omeprazole, Pantoprozole and etc.),
- prokinetiks (Motilium, Cerucal and etc.);

II . Endoscopic interventions.

In the last decade, new minimally invasive endoscopic interventions have been rapidly developing, such as argon plasma coagulation (APC), bipolar and multipolar electrocoagulation, photodynamic therapy and laser ablation of metaplastic epithelium.

Today, lasers have literally penetrated almost all areas of medicine. It would not be a mistake to say that this direction, whether therapeutic or surgical, is the basis for the correction of pathological conditions in this area, each with its own beneficial effects.

Several types of laser are used in medicine:

1. Gas lasers (CO 2 laser, Argon laser, copper vapor laser). 2. Solid-state lasers (ruby, Nd:YAG (neodymium laser), Er:YAG (erbium laser), KTP (neodymium laser), Alexandrite, etc.). 3. Liquid lasers. 4. Diode lasers. They are used for soft tissue procedures. Absorbing chromophores are especially melanin and hemoglobin.

III . Surgical treatment .

The main advantages of surgical treatment of GERD: Basically, conservative therapy relieves symptoms ; with the help of operations, the main causes of reflux can be eliminated; positive results occur in more than 90% of patients; reduction _ the need for constant drug therapy.

The main indications for antireflux operations (according to A.N. Ogorokov):

- esophageal stricture;
- deep hemorrhagic ulcers of the esophagus,
- Barrett's esophagus.

Contraindications to antireflux operations are:

- oncological diseases;
- various diseases blood clotting ;
- mental disorders;
- high surgical and anesthetic risk (heart failure , stage III–IV , liver cirrhosis, liver failure, renal failure, etc.).

Soloviev G.M. and co-authors (2018) believe that establishing the degree of epithelial dysplasia is important for determining the treatment tactics for patients

with BE. They believe that if there is no dysplasia, then dynamic observation with annual endoscopic examination is advisable.

Fitzgerald R.C. et al (2015) believe that patients with BE should be taken under careful dispensary endoscopic and morphological observation. If high-grade dysplasia is detected in the metaplastic epithelium, they perform extirpation of the esophagus. Luketich J.D. et al (2018) for high-grade dysplasia suggest performing laparoscopic transhiatal esophagectomy.

Junginger T. et al. (2014) believe that Barrett's adenocarcinoma can be radically removed through both transthoracic and transmediastinal approaches.

Grand R.P.et al. (2021) after extirpation of the esophagus, if there are no conditions for performing reconstruction of the esophagus with the stomach, small intestine, or colon, they suggest cutting out a parascapular free microvascular skin flap, from which a tube is formed and esophagoplasty is performed with it.

Complications of surgical treatment.

The probability of developing complications of surgical treatment methods depends on the type of intervention, the quality of surgical care and is 2–10%.

Specific complications include:

- syndrome gas-bloat " ;
- postoperative dysphagia;
- damage to the vagus nerve;
- "dumping syndrome";
- diarrhea;
- stomach ulcer;
- sliding of the bottom of the esophagus into the stomach with inadequate fixation;
- formation of gastric fistulas;
- slipping of the cuff - the "telescope" phenomenon - sliding of the cardiac region and fundus of the stomach from the cuff (" slipped " Nissen " -"sliding Nissen").

Summary. Thus, today one of the pressing problems of modern endoscopy and surgery is the improvement of methods for diagnosing and treating pathological conditions of the esophageal mucosa with GERD. The use of various endoscopic interventions, determination of indications for the use of new methods of local endoscopic treatment using laser in the complex treatment of complicated forms of GERD will reduce the meta- and dysplastic area, reduce the number of relapses and complications of GERD.

CHAPTER II. CLINICAL CHARACTERISTICS OF THE MATERIAL, REVIEW RESEARCH METHODS AND LASER TECHNOLOGIES .

The presented research work is based on the experience of surgical and endoscopic treatment of 154 patients with complications of GERD such as stage II - IV reflux esophagitis, who were in the department of thoracoabdominal oncosurgery, outpatients of the polyclinic-diagnostic department of the State Institution "RSNPMCCH named after Acad. V.Vakhidov" and in the diagnostic department of the Samarkand SMU for the period from 2023 to 2024.

One of the goals and the main idea of this research work is to develop standards for surgical treatment of this category of patients based on the introduction of lowtraumatic technologies and the use of IR diode laser radiation.

The patients were divided into 2 groups: The comparison group consisted of 96 patients who underwent traditional treatment methods - conservative therapies and anti-reflux surgical interventions (Nissen fundoplication, incomplete fundoplication and others).

Table 2.1

Distribution of patients by age in the compared groups

	Control group (n=96)	**Main group** (n=58)	**Total (n=154)**
19-44	29 (18,8%)	19 (12,3%)	48 (31,1%)
45-59	32 (20,7%)	17 (11,1%)	49 (31,8%)
60-74	30 (19,5%)	12 (7,8%)	42 (27,3%)
75 and more	5 (3,3%)	10 (6,5%)	15 (9,8%)
Total	96 (62,3%)	58 (37,7%)	154 (100%)

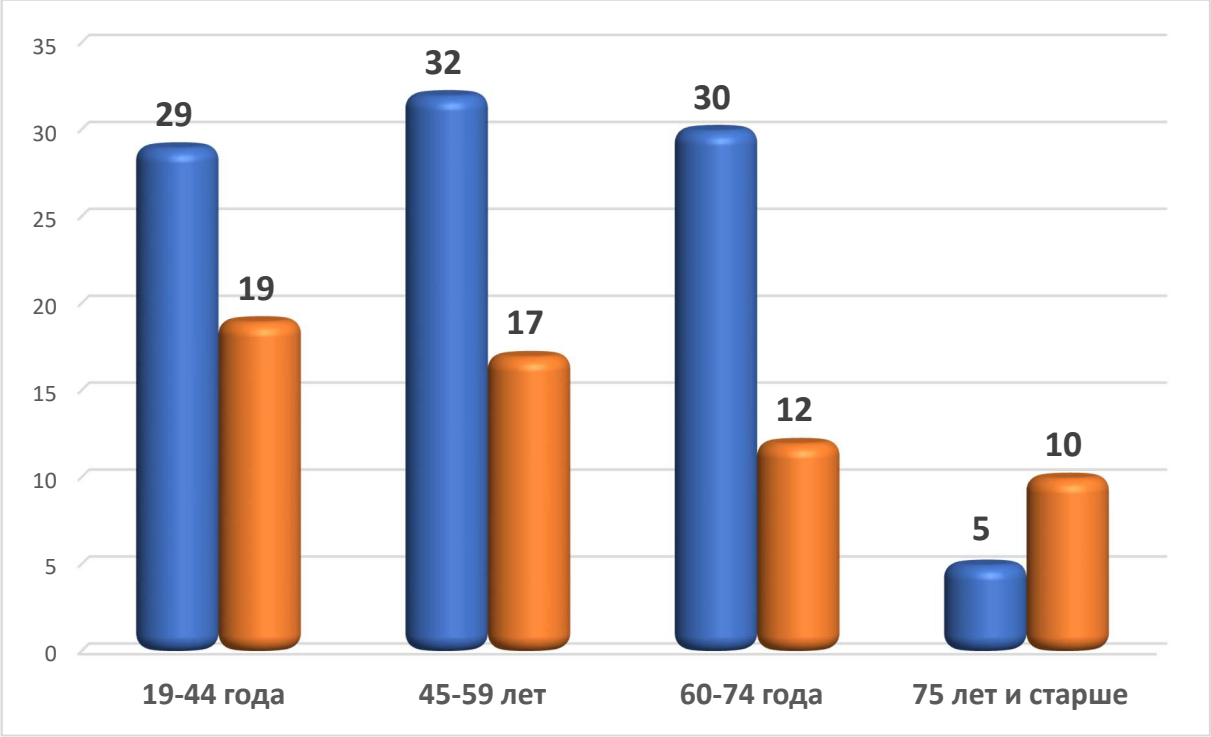
The main group consisted of 58 patients who underwent complex treatment methods using laparoscopic techniques, conservative therapy and the use of IR diode lasers. The distribution of patients by age categories in the compared groups is presented in Table 2.1 and in the diagram in Figure 2.1, from which it follows that

the groups are representative, because the differences are not significant ($\chi 2=7.11$, df=3, p=0.068) .

The majority of patients in both the main and comparison groups were aged from 19 to 44 years: 30.2% and 23.1%, respectively. The same data were obtained in other age categories.

In both groups, young and middle-aged patients predominated, according to the age classification adopted by WHO (1963). The age of the patients ranged from 19 to 82 years. The average age in the control group was 57.3 ±12.4 years, in the main group – 54.1±14.1 years, with no significant differences found (t=0.17, df=132, p=0.86).

The majority were young (31.1%) and middle-aged (31.8%) patients - 97 (62.9%), which once again emphasizes the importance of work in the social aspect, because performing complex operations can lead to long-term rehabilitation of the operated patients.



Pic. 2.1 . Distribution of patients by age in the compared groups

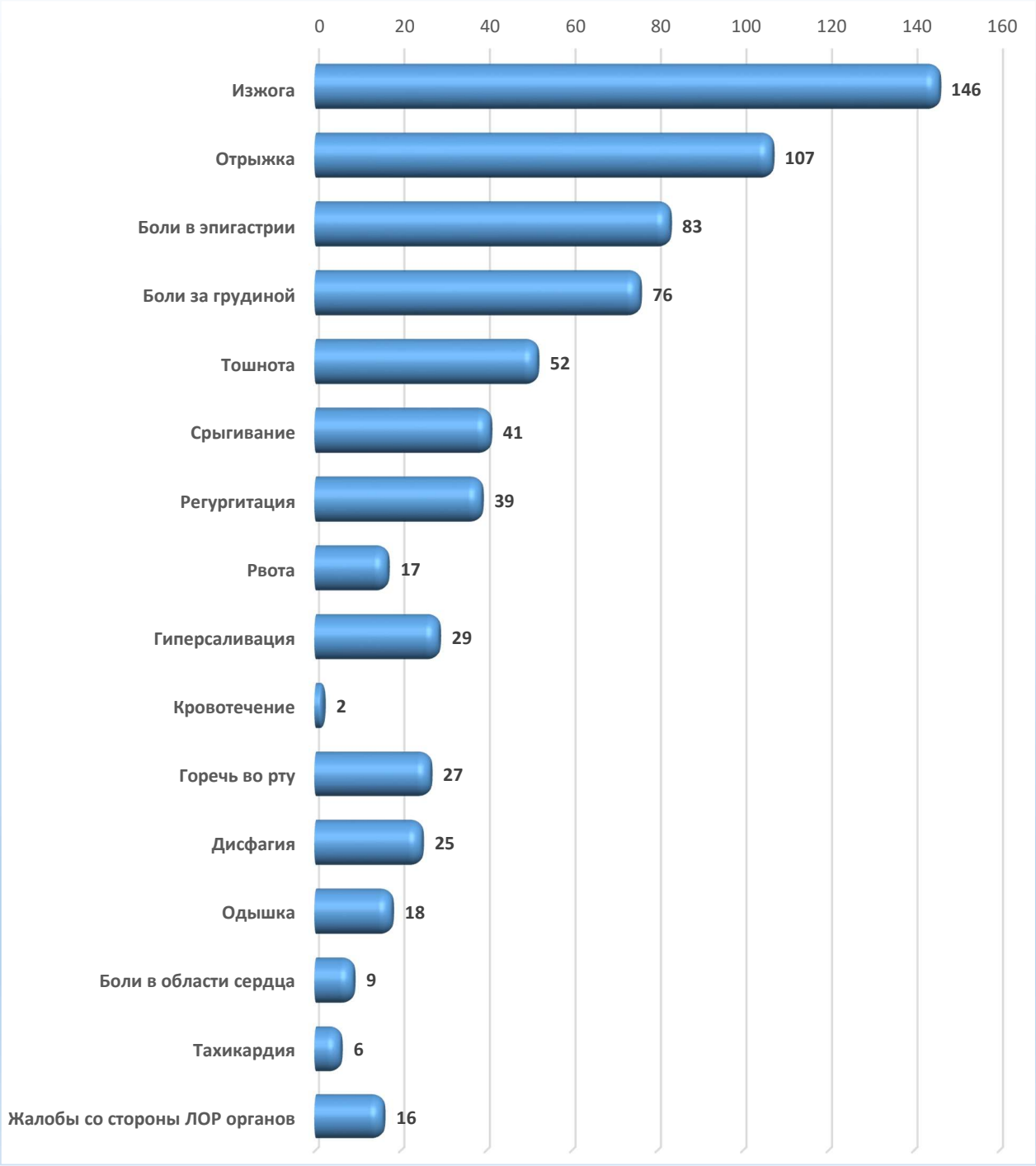
There were 36 (62.1%) men in the main group, 22 (37.9%) women, 51 (53.1%) men in the control group, and 45 (46.9%) patients in the control group. The comparison groups did not differ significantly by gender ($\chi 2=1.18$, $p=0.28$). The standard distribution of patients by gender is presented in Table 2.2.

Table 2.2

Distribution of patients by gender

	Control group (n=96)	**Main group** (n=58)	**Total (n=154)**
Men	51 (53,1%)	36 (62,1%)	87 (56,5%)
Women	45 (46,9%)	22 (37,9%)	67 (43,5%)
Total	96 (62,3%)	58 (37,7%)	154
Credibility	$\chi^2=1.18$, $p=0.28$		

Upon admission, patients presented with various complaints, the most common of which were heartburn, which accounted for 94.8% of the total number of complaints. In second place in frequency of occurrence was belching, which amounted to 69.5%. In third place in frequency were epigastric pain – 53.9%. A detailed analysis of the complaints made upon admission is shown in Figure 2.2.



Pic. 2.2. Complaints of patients upon admission.

As follows from Figure 2.2. the number of complaints is more than twice the number of patients. This is due to the fact that one patient had two or more complaints upon admission.

When analyzing the duration of the disease, we found that patients with GERD were treated within a period of 1 to 2 years - 46 (29.9%), from 3 to 5 years -

58 (37.7%), from 6 to 10 years - 31 (20.1%) and more than 10 years from the onset of the disease – 19 (12.3%). When analyzing the obtained anamnestic data, it was found that the largest number of requests was within 3 to 5 years from the onset of the disease -58 patients, which amounted to 37.7%. The presentation of patients at a later date was also apparently due to the implementation of an incomplete set of diagnostics. Thus, 79 (51.3%) patients, before treatment, received conservative treatment for various somatic diseases: esophagitis -26 (32.9%), gastritis - 36 (45.6%), COPD - 6 (7.6%), cardiovascular diseases – 11 (13.9%) patients.

When collecting anamnesis, we found that 26 (16.9%) patients had undergone various operations in the anamnesis. Of these, 21 (80.8%) were in the abdominal cavity and 5 (19.2%) on the pelvic organs. The analysis of transferred operations is presented in Table 2.3.

Table 2.3

Distribution of patients according to the nature of operations in history

Operation name	Total
Appendectomy	7 (26,9%)
Nissen fundoplication	1 (3,8%)
Cholecystectomy	5 (19,3%)
Hysterectomy	2 (7,7%)
Surgery for ectopic pregnancy	1 (3,8%)
Cesar-section	2 (7,7%)
Gastric resection	4 (15,4%)
Hernia repair	4 (15,4%)
Total	**26 (100%)**

All operations performed were performed using an “open” approach, with the largest number being appendectomy in 7 (26.9%). The next most common was cholecystectomy, performed in 5 (19.3%) patients, and gastric resection and hernia repair were performed in 4 (15.4%) patients, surgery on the pelvic organs (for ectopic pregnancy, hysterectomy and cesarean section). section amounted to 19.2% and the remaining operations performed amounted to 3.8%.

When assessing the esophageal mucosa, reflux esophagitis II - IV was established in all 154 patients degrees. Distribution of patients depending on the degree of reflux esophagitis according to Savary - Miller : stage II reflux esophagitis - in 107 (69.5%), degree III - in 23 (14.9%) and degree IV - in 24 (15, 6%) patients. When assessing the prevalence of EC, endoscopic examination revealed that damage to the abdominal esophagus was observed in 48%, the lower third of the thoracic esophagus was observed in 39% of cases, and damage to the middle and lower third of the esophagus was observed in 13%.

In 103 (66.9%) patients, various types of hiatal hernia were identified.

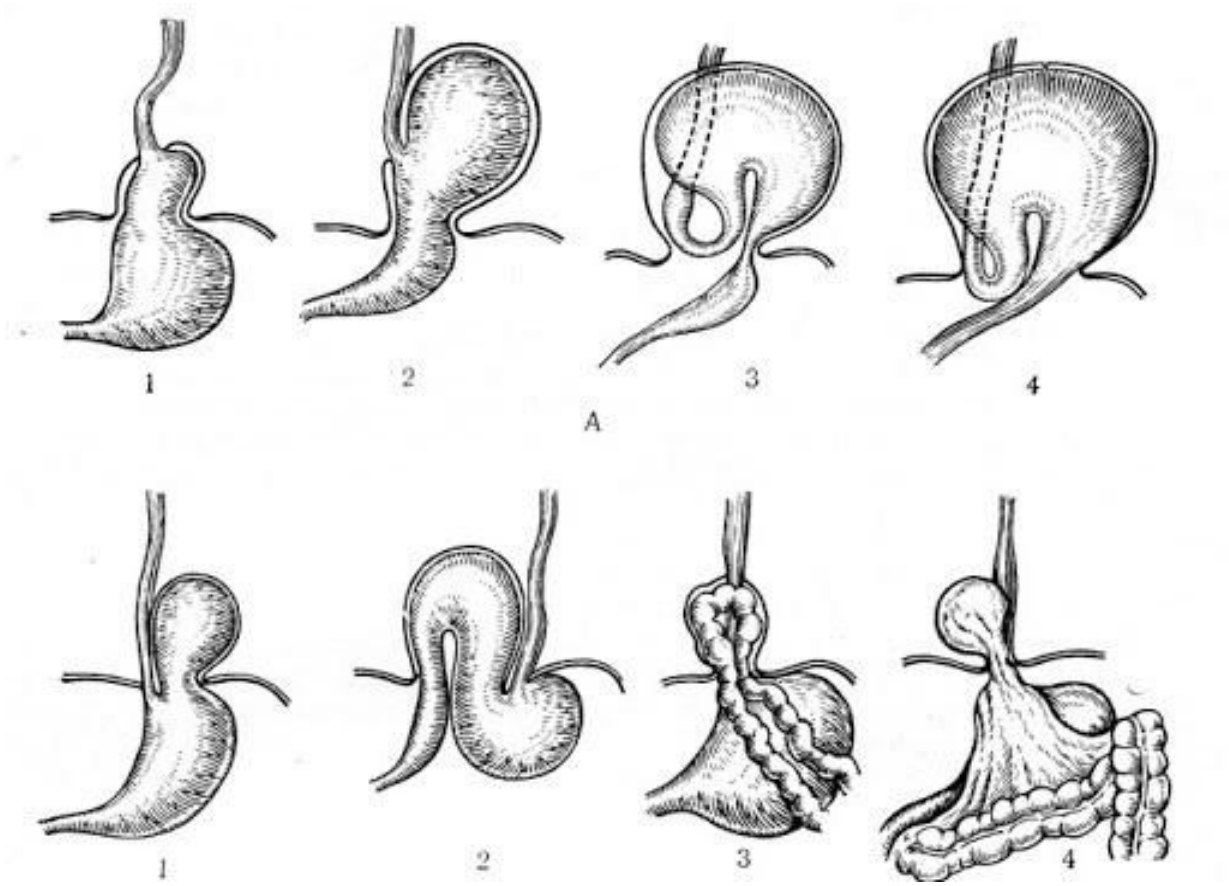
The most common and popular classification of hiatal hernia was the distribution according to B.V. Petrovsky and N.N. Kanshin (1967) (Fig. 2.3):

I. Sliding (axial) hernias: esophageal, cardiac, cardio-fundal, subtotal gastric, total gastric (fixed and non-fixed).

1. Without shortening the esophagus

2. With shortening of the esophagus (grades I and II (more than 4 cm))

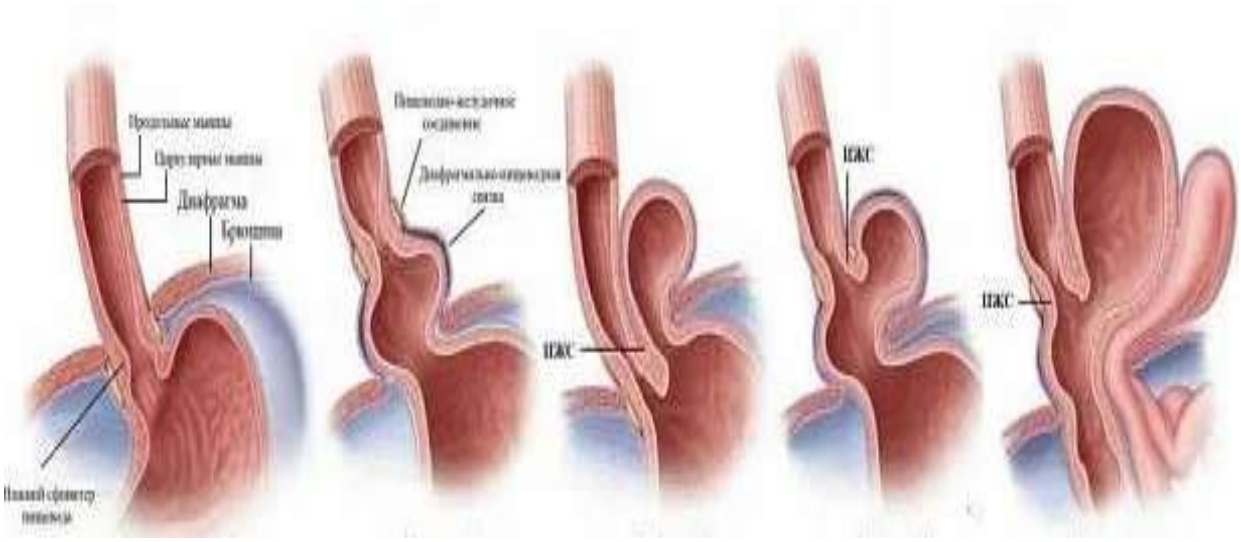
II. Paraesophageal hiatal hernias: fundal, antral, intestinal, gastrointestinal, omental.



Pic. 2.3. Classification of hiatal hernias according to B.V. Petrovsky and N.N. Kanshin.

However, at present, this classification may not always fully reflect all types of hiatal hernia. And if for small axial hernias (esophageal, cardiac) this classification is applicable, then for subtotal and total paraesophageal gastric hernias, the cardia will almost always be higher than the diaphragm, which does not always correspond to all points of the classification proposed in 1967.

In this regard, we currently adhere to the classification recommended in 2013 by the American Association of Gastroenterological and Endoscopic Surgeons (SAGES) for the treatment of hiatal hernias, which includes 4 types of hiatus hernias (Fig. 2.4).



Pic. 2.4. Types of hiatal hernia according to SAGES.

Type I hernias - sliding hiatal hernia - the esophagogastric junction (EGJ) is displaced above the diaphragm, but the stomach retains its normal longitudinal position, and its bottom remains below the EGJ. Type I hernias were diagnosed in 85 (82.5%) of 103 patients, of which 3 (2.9%) had esophageal hernias, 78 (75.7%) had cardiac hernias and 4 (3.9%) had cardio-fundal hernias. %) of patients.

A short esophagus of grade I was found in 11 (10.7%), grade II in 6 (5.8%) and normal length of the esophagus was in 68 (66%) patients.

Type II hernias are true paraesophageal hernias - the pancreas remains in its normal position, but part of the fundus or antrum of the stomach moves upward along the esophagus. Type II hernias were diagnosed in 2 (1.9%) of 103 patients.

Type III hernias are a combination of types I and II , i.e. – The pancreas and the fundus of the stomach are displaced upward through the diaphragmatic opening. In this case, the fundus of the stomach is located above the EC. Type III hernias were diagnosed in 16 (15.6%) patients, with subtotal gastric hernias in 2 (1.9%) patients.

Type IV hernia - in the hernial sac, in addition to the stomach, there are other abdominal organs (large and small intestine, omentum, spleen).

The distribution of patients by type of hiatal hernia in the compared groups is presented in Table 2.5. In our work, we did not encounter patients with type IV.

Table 2.5 .

Distribution of patients by type of hiatal hernia in the compared groups

Type of hernia	Control group (n=96)	Main group (n=58)	Credibility
Type I	57 (55,3%)	28 (27,2%)	χ^2=0.86, p=0.35
Type II	1 (1%)	1 (1%)	χ^2=0.2, p=0.65
Type III	9 (8,7%)	7 (6,8%)	χ^2=0.64, p=0.42
Total	67 (65%)	36 (35%)	χ^2=0.97, p=0.32
Credibility	χ^2=0.9, df=2, p=0.64		

Type I hiatal hernia is characterized by weakness and elongation of the esophageal-phrenic ligament, which plays an important role in maintaining the normal intra-abdominal position of the esophageal phrenic ligament. This laxity of the ligamentous apparatus leads to varying degrees of migration of the esophagogastric junction through the dilated diaphragmatic opening. As a group, types II–I are paraesophageal hernias and are distinguished from type I hernias by the relative sparing of the posterolateral esophagophrenic ligaments around the esophagogastric junction. Among paraesophageal hiatal hernias, type III is the most common, and type II is the least common.

The total number of type I hernias was 82.5% - 85 patients, type II was found in 2 (2%), type III - in 16 (15.5%). A comparative analysis of the types of hernias in the groups showed approximately equality in type II hernias.

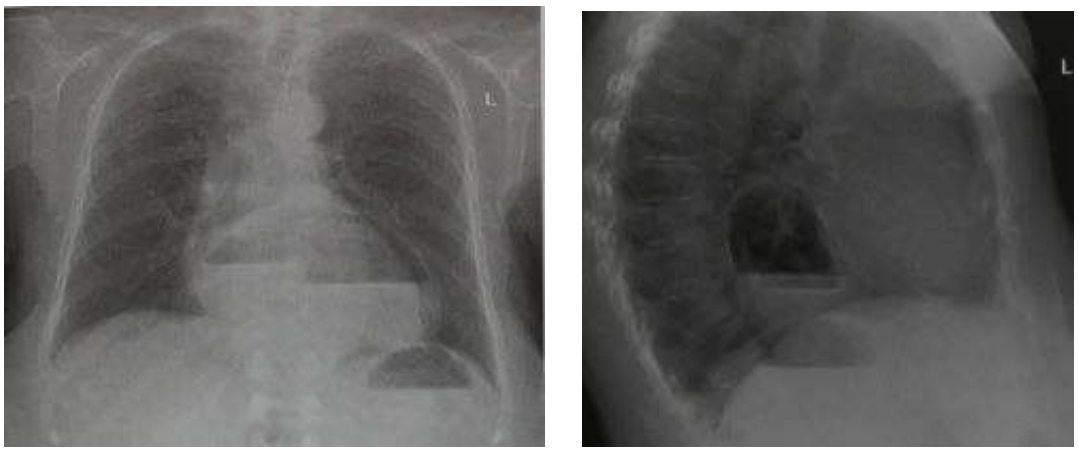
In the compared group, type I hernias significantly (χ2=0.86, p=0.35) prevailed - 84.3% compared to the main group - 45.3%; on the contrary, type III hernias in the compared group were significantly more common (χ2=0.64, p=0.42) lower (13.4%) compared to the main one – 50.6%.

Surgical intervention was performed in 103 (66.9%) patients: 45 (77.6%) patients from the main group and 58 (60.4%) from the control group. All operated patients underwent laparoscopic Nissen or Toupet fundoplication.

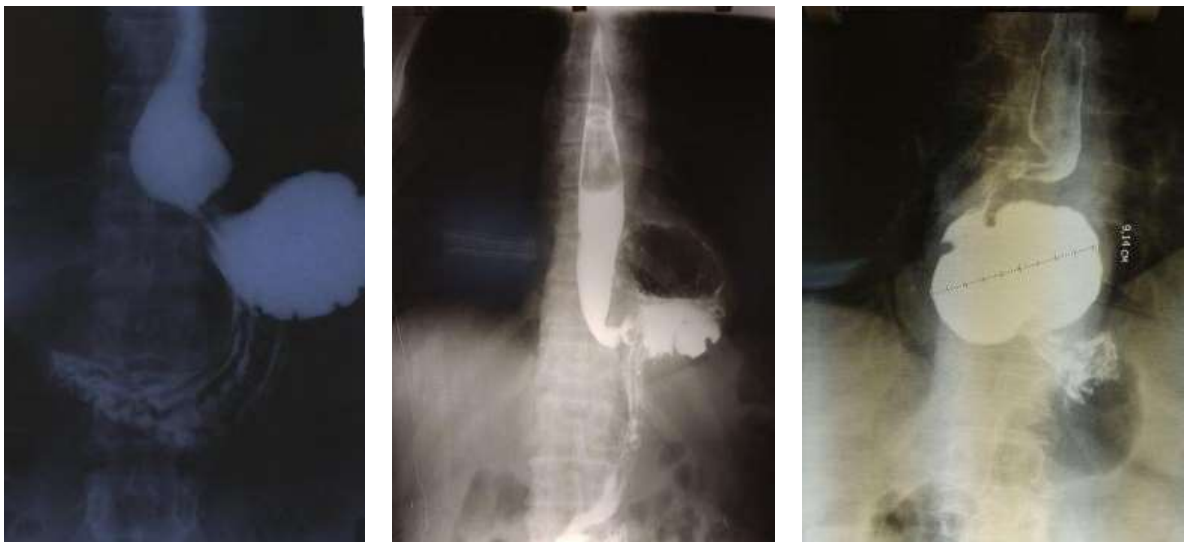
General characteristics of methods of the research

All patients admitted with GERD underwent a set of diagnostic methods in order to establish the correct underlying disease and concomitant pathology.

X-ray contrast examination of the esophagus and stomach was carried out using the Miratel apparatus from General Electrics (Italy). At the first stage, a survey fluoroscopy of the chest is performed, against the background of which it is possible to identify the level of fluid in the stomach, displaced into the mediastinum (Fig. 2.5). Direct projection Lateral projection.



Pic. 2.5. Plain radiography of the chest.



Hernia type I Type II hiatal hernia Type III hiatal hernia

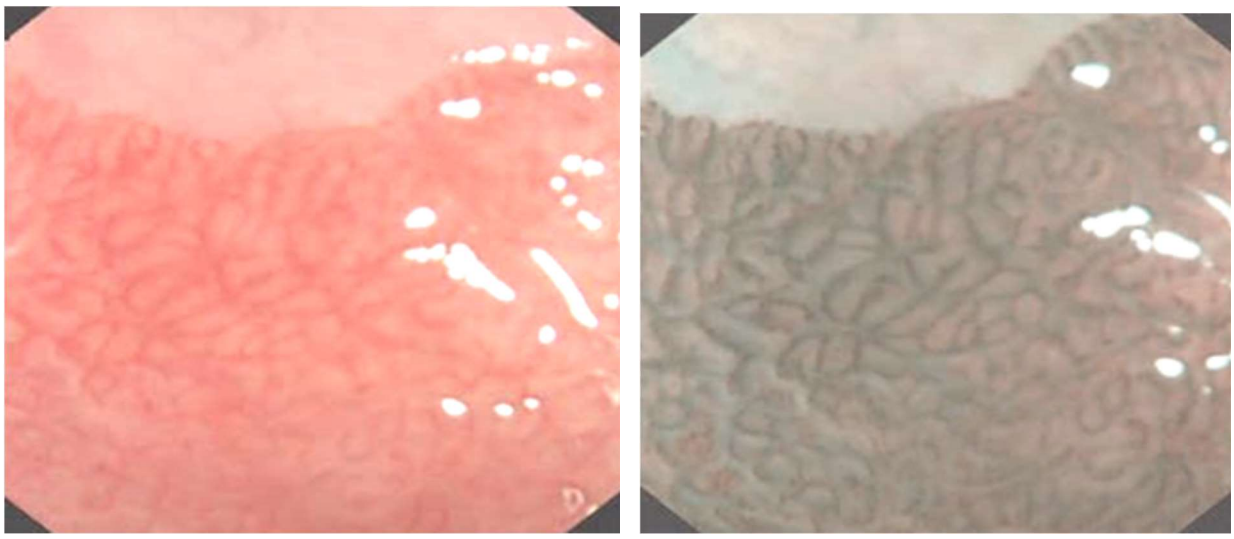
Pic. 2.6. X-ray contrast examination of the esophagus and stomach.

A prerequisite is to examine the patient in a horizontal position, in the Trendelenburg position. X-ray examination (Fig. 2.5-2.6) was performed in all patients before and after surgery.

Esophagogastroduodenofibroscopy (EGDFS) was performed with an endoscope from FUJINON FUJIFILM System 2500 Processor (Japan), as well as with the Olympus endoscope (Japan) with the ability to study in NBI mode , which has several advantages over a conventional endoscope, which provides more informative data in the diagnosis of erosive and dysplastic changes in the esophageal mucosa . Endoscopic examinations were performed in all patients with GERD.

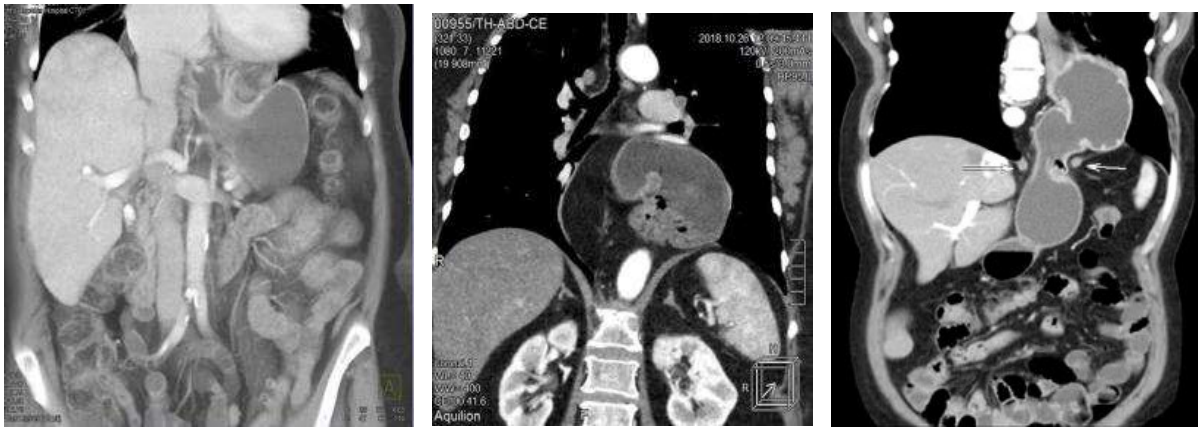
The main purpose of endoscopic examination is to determine the condition of the esophageal mucosa, the presence of complications of reflux esophagitis (Kay's, Richter's, Quincke's ulcers), as well as to identify concomitant pathologies of the stomach and duodenum (ulcers, diverticula, erosions, tumors). If there is a suspicion of ectopia of the mucous membrane of the stomach and small intestine, a targeted biopsy is necessarily taken in the distal esophagus for the purpose of morphological verification of Barrett's esophagus.

In Fig. 2.7. endoscopic pictures are presented in normal and narrow-spectrum mode (NBI mode): uniform villous structures of the surface of the mucous membrane with long branched blood vessels, which were regarded as the main signs of BE without dysplasia.



Pic. 2.7. Endoscopic images in normal and narrow-spectrum mode (NBI mode).

Multislice computed tomography (MSCT) was performed on an Optima - 660 device, manufactured by GE (USA), with the ability to perform 0.625 mm slices.



Type I - Axial hiatal hernia | Type II - Paraesophageal hiatal hernia | Type III Mixed form of hiatal hernia

Pic. 2.8 . MSCT of hiatal hernias.

MSCT (Fig. 2.8.) is one of the standard studies that allows differential diagnosis between types of hernias. The study is carried out in the morning, on an empty stomach. To conduct MSCT, 1 hour before the examination, the patient is given 500 ml of water with 20 ml of water-soluble contrast to drink.

Ultrasound of the abdominal organs. SonolineVersaPro scanners from SIMENS in real time with a linear sensor with a frequency of 7.5 MHz, used to study surface structures, and a convex sensor with a frequency of 3.5 MHz. Ultrasound is included in the complex of standard examinations. Ultrasound of the abdominal and pelvic organs determines the condition of their organs and identifies concomitant pathologies (calculous cholecystitis, echinococcosis, liver and pelvic cysts), which determines the need for simultaneous interventions.

Study of external respiration function. A study of pulmonary function was carried out to determine restrictive and obstructive disorders that play an important role in the development of bronchopulmonary postoperative complications.

The study was carried out in the morning, on an empty stomach, in a sitting position. The following parameters were determined: vital capacity (VC), forced vital capacity (FVC), forced expiratory volume in the first second (FEV1), Tiffno index. The degree of dysfunction of external respiration was assessed as “moderate”, “significant” and “severe” obstructive and restrictive changes.

Experimental and morphological studies.

The experiments were carried out at the training center of the Department of Experimental Surgery of the State Institution “RSNPMCCH named after. Academician V.Vakhidov." The experiments were carried out in accordance with the requirements for humane treatment of laboratory animals and ethical standards proposed by the Ministry of Health of the Republic of Uzbekistan and the Ethics Committee of the State Institution “RSNPMCH named after. acad. V.Vakhidov.” To fully identify the effects of IR diode laser beams on the mucous membrane of the esophagus, we used different species of animals (rodents, mammals). The main objectives for conducting a series of experimental and morphological studies were to determine the optimal effective dose and exposure time, as well as to identify the distance of the light guide of IR diode laser beams on the esophageal mucosa in rats and pigs for the healing of erosions of the esophageal mucosa .

The results of this study made it possible to recommend the most optimal options for using IR diode laser effects when used in the surgical treatment of GERD complicated by pathological conditions of the esophageal mucosa. In the experiments, 3 pigs of 5 months of age, weighing 30-32 kg, were prepared for this, and 42 outbred rats weighing 180-230 grams were also used.

To study the voltage and time interval of IR diode laser beams in the esophageal mucosa of rats and pigs, as well as the distance of the light device relative to the tissue, we conducted several step-by-step experiments.

Experimental animals were divided into different equal groups. In all groups, irradiation was carried out in a certain mode of various dosages, distance and time in the area of previously artificially damaged part (area of erosions). Euthanasia of animals was carried out by drug overdose. Tissue samples were taken. Biomaterials obtained from experimental animals were examined on days 1, 3, 7 and 14 after surgery.

Technical characteristics of lasers and methods of their use

Inside the esophageal endoscopic laser therapy was carried out using an IR diode laser device from Lakhta-milon. Experimental animals, i.e. rats, have an average thickness of the esophageal wall of 0.5-1.0 mm, and adult experimental pigs have an average thickness of 3-5 mm [94; pp. 188-193, 96; pp. 33, 153; pp. 24-27] .

The impact of IR diode laser irradiation in pulsed mode with a power of 7 W, energy 212 J, wavelength 970 nm, distance 0.5 cm, exposure from 2 to 5 seconds on the " normal" and "erosive" mucous membrane of the esophagus was observed for the first 3 days an increase in swelling of the mucous membrane followed by a decrease in swelling. After 14 days, the mucous membrane had completely recovered. The procedures were carried out in up to three sessions, mostly twice.

Laparoscopic equipment

The operations were performed using a multifunctional endosurgical complex OR 1 and instruments from KarlStorz GMBH & CO.KG (Germany). The hardware included a standard set of laparoscopic instruments, including 4 trocars (5.10 mm).

During the intervention, the following were used: voleylab energy platform with LigaSure technology from Covidien (USA), ultrasonic scalpel Harmonic G11 (Johnson & Johnson, USA).

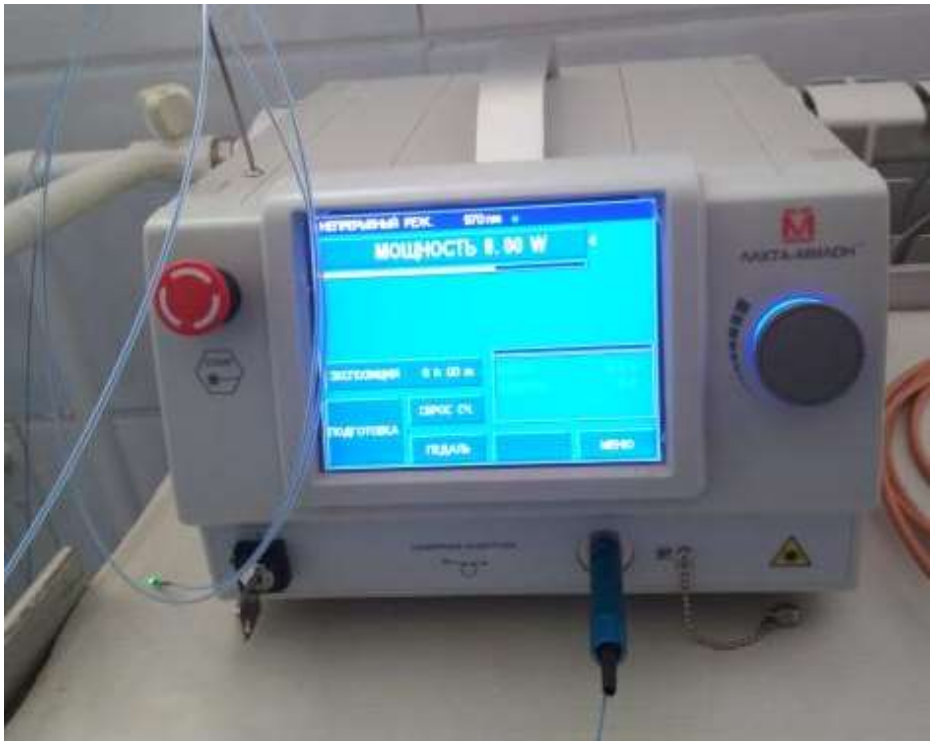
Methodology for statistical data processing

The results were statistically processed on a computer using Excel 7.0. The arithmetic mean (M), standard deviation (σ), and error of the mean (m) were calculated. For indicators with an incorrect distribution, the median was calculated. Student's t-test was used to compare mean values. Correlation was assessed using nonparametric methods (Spearman analysis). Nonparametric characteristics were

compared using contingency tables of characteristics using the $\chi 2$ criterion . The level of reliability of statistical indicators was taken to be $p<0.05$.

III CHAPTER. EXPERIMENTAL AND MORPHOLOGICAL JUSTIFICATION OF THE MECHANISMS OF INFLUENCE OF IR-DIODE LASERS ON THE ESOPHAGUS MUCOSA (experimental and morphological studies)

The studies were carried out at the training center of the Department of Experimental Surgery of the State Institution “RSNPMCCH named after. Academician V.Vakhidov." To fully identify the effects of IR diode laser beams on the mucous membrane of the esophagus, different animal species (rodents, mammals) participated in the experiment. To influence the esophageal mucosa of experimental animals, an IR diode laser device from Lakhta-milon was used (Fig. 3.1).



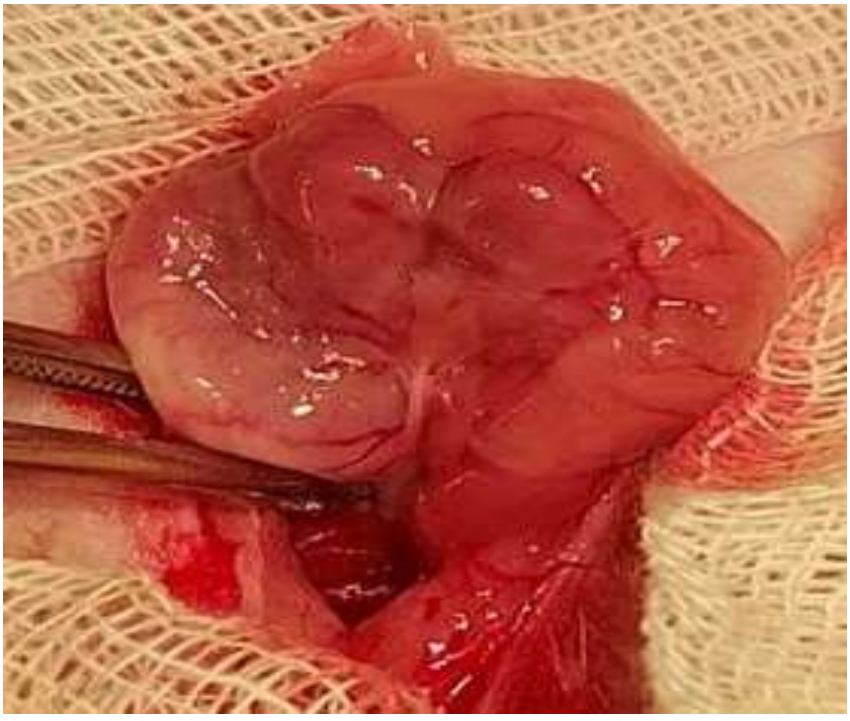
Pic. 3.1. IR diode laser device “Lakhta-milon”.

All experiments were carried out in accordance with the requirements for humane treatment of laboratory animals and ethical standards established by the Ministry of Health of the Republic of Uzbekistan and the Ethics Committee of the State Institution “RSNPMCH named after. Academician V.Vakhidov."

Features of the effect of an IR diode laser on the mucous membrane of the esophagus in rats in an experiment .

The first experiments were carried out on white outbred rats weighing 200-250 grams. The objective of the study was to determine the optimal effective dose and time of exposure, as well as the effect of the distance of exposure to IR diode laser beams on the esophageal mucosa of rats.

All experiments on rats were carried out in stages under general inhalation anesthesia using Sevofluran solution, observing aseptic and antiseptic rules. The rats underwent an upper-median laparotomy measuring 2.5-3.0 cm along the linea alba of the abdomen. The stomach was brought out onto the wound and an anterior gastrotomy was performed in the transverse direction measuring 2.0 cm (Fig.3.2). The esophageal mucosa was exposed to a laser beam. Afterwards, a single-row continuous everting suture was placed on the stomach using a 4/0 vicryl thread. The surgical wound was sutured tightly in layers with a continuous single-row atraumatic vicryl suture of size 3/0.



Pic. 3.2. Photo illustration of the appearance of the stomach and esophagus of a rat.

In the postoperative period, daily monitoring of the general condition, activity, diet, body weight and condition of the postoperative wound of the rats was carried out. According to the plan, euthanasia of animals was carried out using an overdose of snarcotic drugs at different times in the postoperative period (at 1, 3, 5, 7 and 14 days).

Experimental study of the mechanisms of action of IR diode laser beams on the esophagus of rats for 2 seconds .

For 1-experiment, 16 rats were recruited. Each comparison group included 8 rats. Rats of the main group were exposed to a laser beam with a power of 5 W and 7 W, an energy force of 212 J, and a wavelength of 970 nm at a distance of 0.5 cm from the tissue for 2 seconds through a gastrotomy incision into the lower third of the esophagus. The esophageal mucosa of rats in the control group was exposed to a laser beam of the same power and by contact.

Rats were euthanized on days 1, 3, 5, and 7 of the postoperative period. On day 1 , the condition of the postoperative wound of the rats of both comparison groups was satisfactory; when opening the abdominal cavity, no pathological changes were detected in the abdominal cavity, the area of the gastrotomy incision was not changed, and no macroscopic changes were detected in the esophagus.

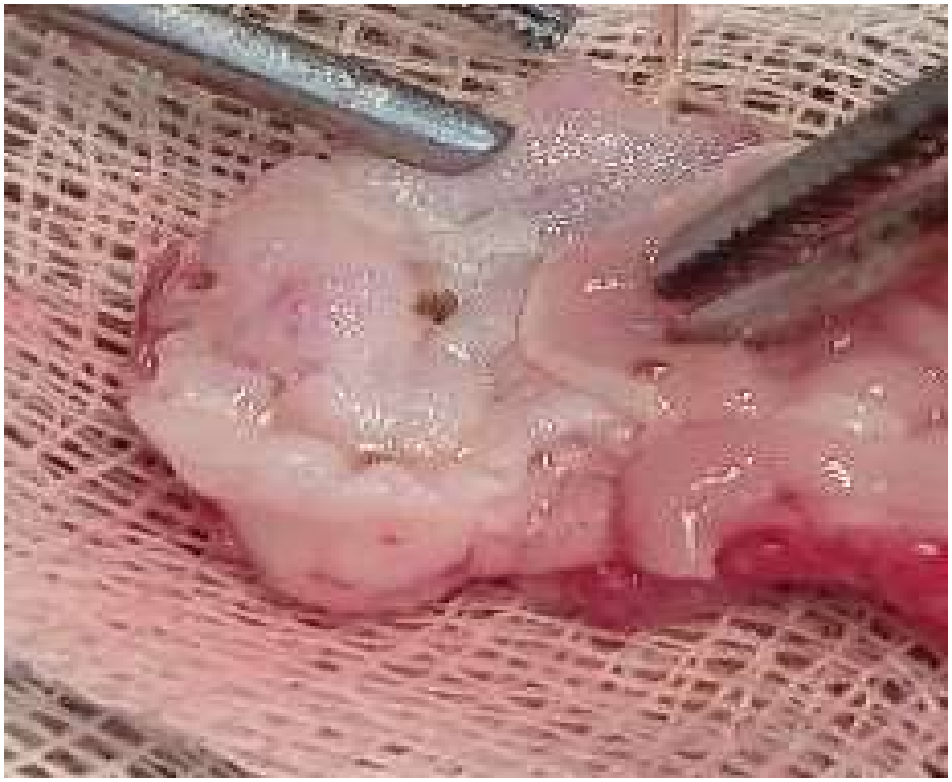
On the 3rd day , the condition of the postoperative wound of the rats in the comparison groups was satisfactory; when opening the abdominal cavity, no pathological changes were revealed, the area of the gastrotomy incision was unchanged. No macroscopic changes were detected in the esophagus of rats from the main group. In a rat from the control group exposed to laser radiation at a voltage of 7W , slight swelling of the esophageal mucosa was detected; foci of necrosis were not identified (Fig. 3.3).

Pic. 3.3. Photo illustration of edematous changes in the mucous membrane of the esophagus of rats in the control group on the 3rd day of the experiment.

On day 5, the condition of the postoperative wound of rats in the comparison groups was satisfactory. When opening the abdominal cavity, no pathological changes were revealed, the area of the gastrotomy incision was unchanged. No macroscopic changes were detected in the esophagus of rats from the main group. In rats of the control group exposed to laser radiation with a power of 5 and 7 W, the preservation of edema in the mucous membrane of the esophagus was observed, with the absence of foci of necrosis.

On the 7th day of the study, the condition of the postoperative wound in rats of both comparison groups was satisfactory. When opening the abdominal cavity, no pathological changes were revealed, the area of the gastrotomy incision was unchanged. No macroscopic changes were detected in the esophagus of rats from the main group. When opening the abdominal cavity of rats in the control group, an adhesive process was discovered between the liver, stomach and esophagus, a slight swelling of the esophageal mucosa was revealed when exposed to laser radiation of

different powers and when exposed to contact exposure to laser radiation with a power of 7 W - small foci of necrosis (Fig. 3.5).



Pic. 3.4. Photo illustration of the formation of rations in the abdominal cavity of rats of the control group (a) and minor necrotic changes in the esophageal mucosa (b) on the 7th day of the experiment.

Experimental study of the mechanisms of action of IR diode laser beams on the esophagus of rats for 4 seconds

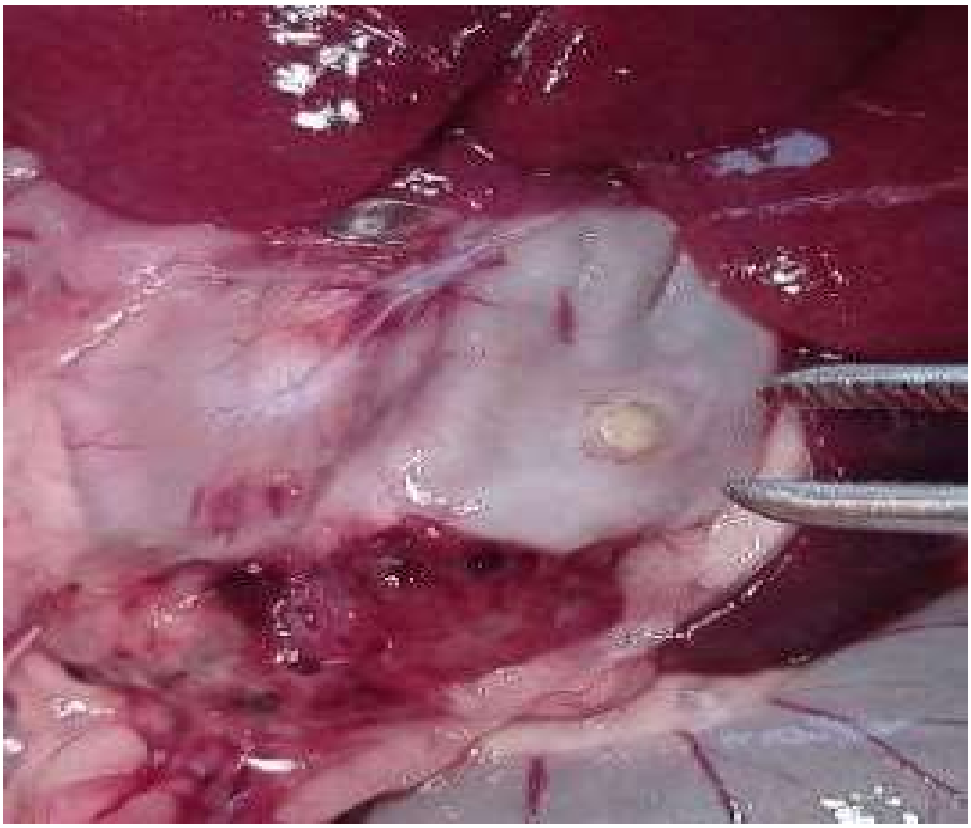
16 experimental rats were also involved in the second experiment, 8 of which formed the main and 8 control groups. The rats of the main group were given an IR diode laser light guide through a gastrotomy incision, and the mucous membrane of the lower third of the esophagus was exposed to a laser beam with a power of 5 W and 7 W, an energy force of 212 J, a wavelength of 970 nm , in a pulsed mode for 4 seconds. The esophageal mucosa of rats in the control group was exposed to a laser beam of the same power by contact.

The rats of the comparison groups were euthanized on days 1, 3, 5 and 7 of the postoperative period. On day 1, the condition of the postoperative wound of rats in

both groups was satisfactory. When opening the abdominal cavity, no pathological changes were revealed, the area of the gastrotomy incision was unchanged. In the mucous membrane of the esophagus of rats in the comparison groups, when exposed to laser radiation with a power of 7W , slight swelling and small foci of necrosis (0.2-0.5 cm) were detected.

On the 5th day, the condition of the postoperative wound in rats of both groups was satisfactory. In rats of the main group, an adhesive process was detected in the upper abdominal cavity; edema and small foci of necrosis of the esophageal mucosa were noted in rats exposed to laser radiation with a power of 7 W.

In the control group, in 2 rats, laparotomy revealed an adhesive process in the upper abdominal cavity, an adhesive process between the liver, stomach and esophagus. When separating the adhesions and opening the esophagus, a perforated hole was revealed. But, due to the adherence of the liver to the opening, peritonitis did not develop (Fig. 3.5).



Pic. 3.5. Photo illustration of the adhesive process between the liver, stomach and esophagus and perforated hole in the lower third of the esophagus.

On day 7, the condition of the rats in both groups of the study was moderate, movement and nutrition were reduced, and body weight was reduced by 15-20 g. When opening the abdominal cavity, the adherence of the omentum and intestines to the liver was revealed, with the formation of strong adhesions and a limited abscess. When separating the adhesions, a perforated hole measuring 0.2x0.1 cm was discovered on the anterior wall of the lower third of the esophagus.

Thus, the results of the experiment showed that exposure of the mucous membrane of the esophagus of white rats to an IR diode laser beam with a power of 5W and 7 W, an energy force of 212 J, a wavelength of 970 nm , for 2 seconds, at a distance of 0.5 cm has a positive effect. healing effect. Irradiation at a contact distance led to necrosis of the mucous membrane of the esophagus of rats. Irradiation for 4 seconds led to perforation of the esophagus on days 5–7 of the experiment in rats from the comparison groups.

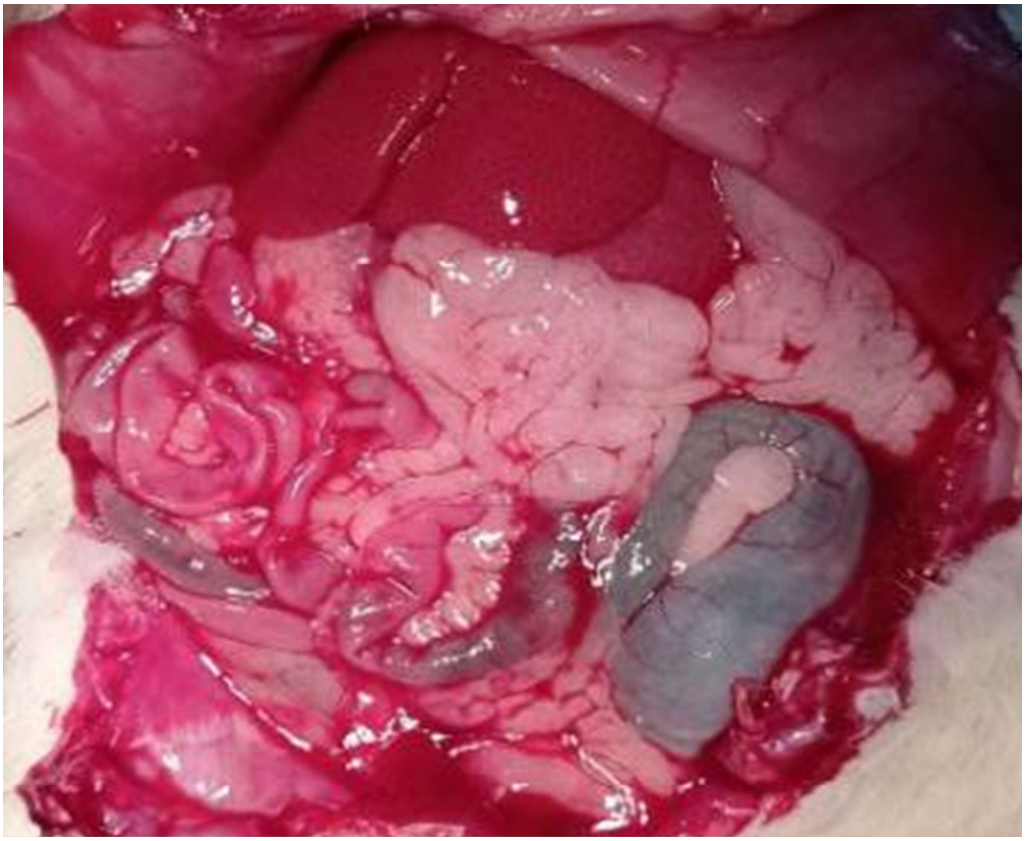
Experimental study of the mechanisms of action of an IR diode laser on the erosive mucosa of the esophagus in rats .

At the next stages of the experiment, erosion was caused on the mucous membrane of the esophagus of rats under mechanical influence. Experimental experiments were carried out on 10 rats (5 rats from the control group and 5 rats from the main group).

The rats of the main group were injected with an IR diode laser fiber through a gastrotomy incision. The erosive mucosa of the lower third of the esophagus was exposed to an IR diode laser beam with an irradiation power of 5 W , an energy force of 212 J, at a distance of 0.5 cm from the tissue for 2 seconds. And in rats in the control group, the esophageal mucosa was exposed to the same power of the laser beam by contact. In the postoperative period, rats of both groups were euthanized on days 1, 3, 5, 7 and 14.

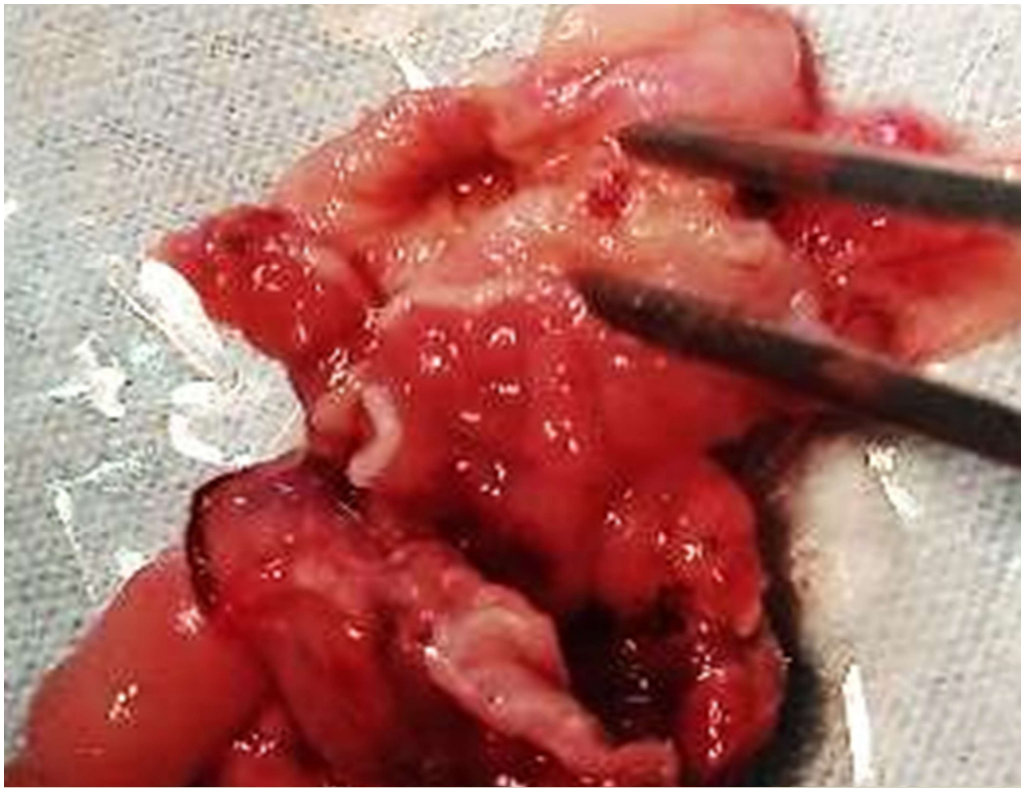
Rats of the main group on the 1st day after surgery were in satisfactory condition: they did not experience any loss of body weight, their nutrition was

satisfactory. The condition of the postoperative wound was also satisfactory; when opening the abdominal cavity, no pathological changes were detected, the area of the gastrotomy incision was unchanged. The mucous membrane of the rat esophagus was slightly swollen and hyperemic; no foci of necrosis were identified (Fig. 3.6).



Pic. 3.6. Photo illustration of a general view of the abdominal cavity of a rat on day 1 after surgery. Photo illustration of edema and hyperemia of the esophageal mucosa.

On the 3rd and 5th days of observation, the external esophagus of the rats was unchanged. The incision revealed preserved swelling of the mucous membrane of the esophagus (Fig. 3.7). On the 7th day, a decrease in the above changes and the disappearance of edema of the esophageal mucosa was revealed (Fig. 3.7).



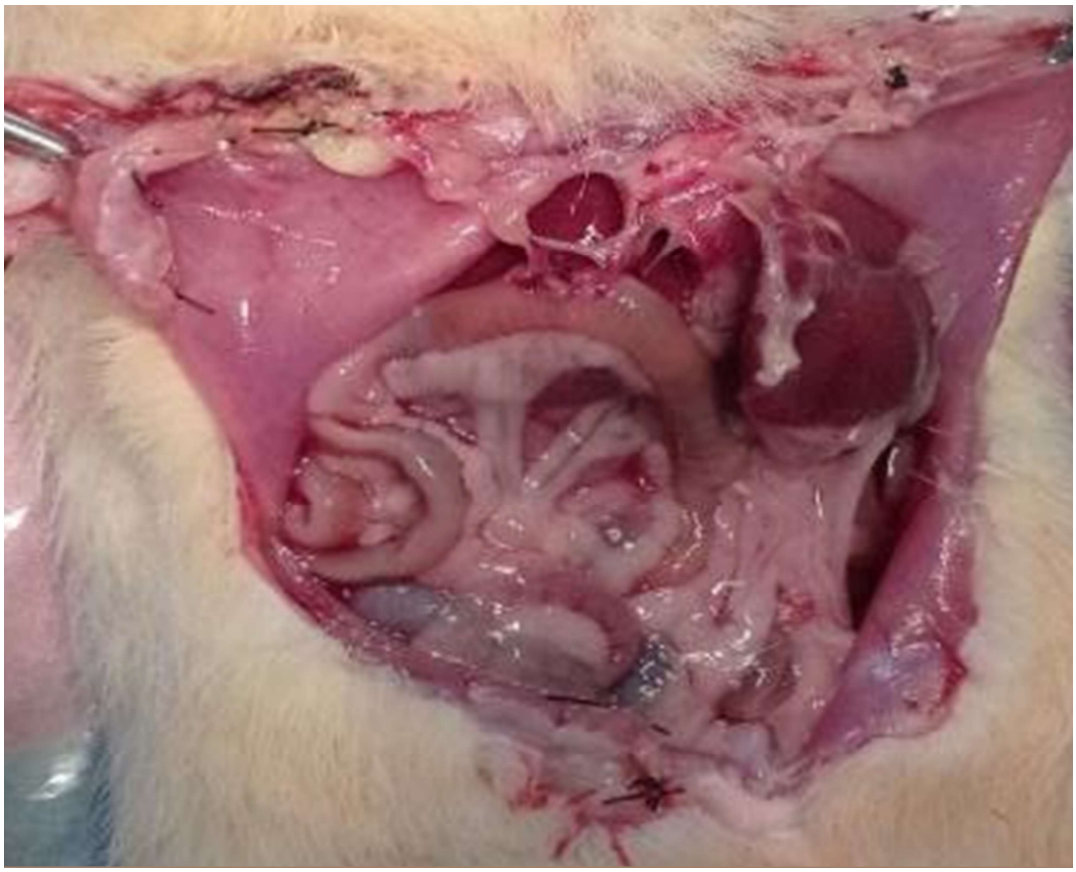
Pic. 3.7 . Photo illustration of the appearance of the erosive mucous layer of the esophagus on days 7 of observation.

On the 14th day, the general condition of the experimental rat of the main group was satisfactory, no changes in nutrition and weight were observed. The condition of the postoperative wound was satisfactory; when opening the abdominal cavity, no pathological changes were revealed; there was a smooth scar in the area of the gastrotomy incision. No macroscopic changes were found in the esophagus of rats.

The condition of the rats in the control group on days 1 and 3 of observation was satisfactory, nutrition was normal, and no loss of body weight was observed. The condition of the postoperative wound was satisfactory, and upon opening the abdominal cavity, the liver was found to be adjacent to the stomach and esophagus, with the formation of adhesions that were easily peeled off. When opening the esophagus, a focus of necrosis was discovered.

On day 5, the condition of the rats in the control group was moderate and exhausted. At autopsy, on the upper floor of the abdominal cavity there was an adhesive process between the greater omentum, liver and intestines. When

dissecting the adhesions, local peritonitis with a fetid odor was discovered; a perforation hole measuring 0.2x0.1 cm was identified in the anterior wall of the esophagus (Fig. 3.8).



Pic. 3.8. Photo illustrations of perforation of the anterior wall of the esophagus and peritonitis.

The control group rats kept for euthanasia on days 7 and 14 died on day 6 . Upon opening the abdominal cavity, purulent peritonitis with a putrid odor was found in both animals. The organs of the abdominal cavity are fused to each other with the formation of adhesions; the organs are completely covered with purulent fibrin. On the anterior wall of the lower esophagus, a perforated hole measuring 0.2x0.2 cm was identified.

Summary. Thus, the results of the experiments showed that when exposed to IR diode laser irradiation with an energy force of 212 J, an impact power of 5 W at a distance of 0.5 cm from the tissue for 2 seconds on the erosive mucous membrane of the esophagus of white rats, hyperemia and swelling of the mucous membrane are

initially observed . After 5-7 days of observation, the mucous membrane is completely restored. It should be noted that laser exposure by contact is impractical, because 4-5 days after the operation, perforation of the esophagus is observed, which leads to the death of rats.

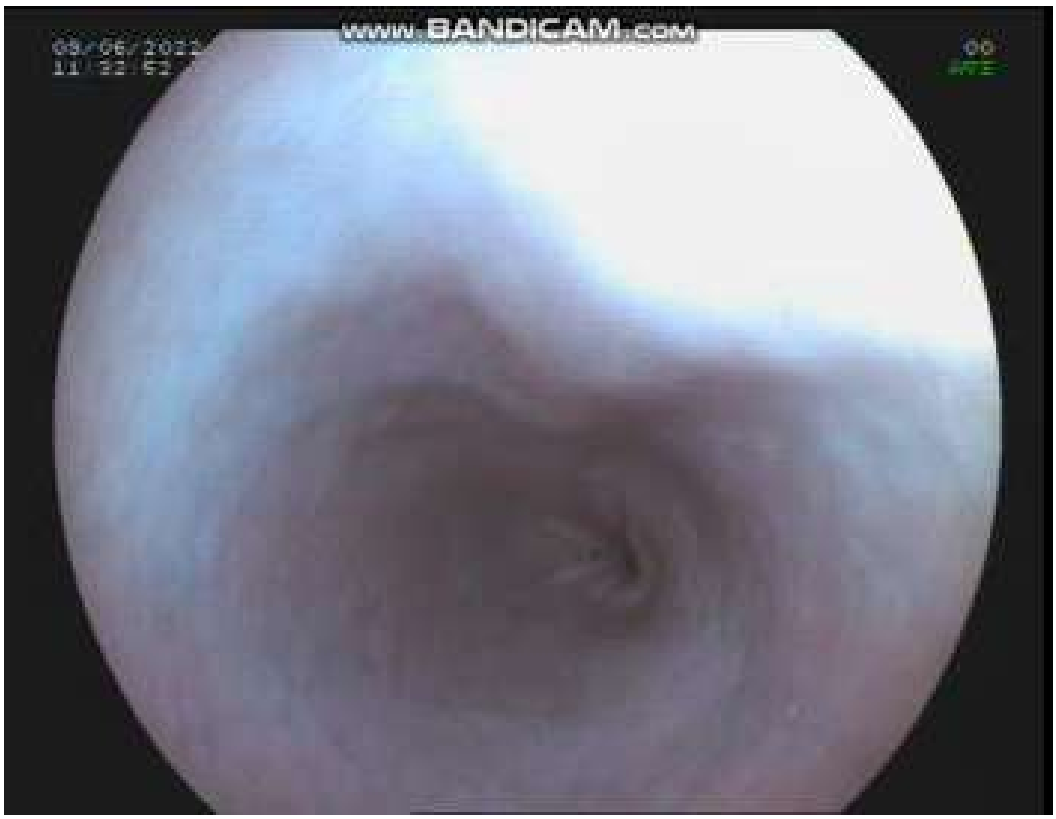
Experimental study of the effects of an IR diode laser on the mucous membrane of the pig esophagus

For the second stage of the experiment, pigs were recruited. Pigs belong to the order of mammals; in the structure of anatomical organs and functions they are considered closer to humans [22; pp. 188-193, 24; pp. 33, 42; pp. 82-104, 83; pp. 53-66] . Three outbred pigs, 5-6 months old, were prepared. The average weight of animals was 30-32 kg . The thickness of the wall of the esophagus of rats and pigs is different, so the mucous membrane of the esophagus of pigs was exposed to an IR diode laser beam with a power of 7 W and 9 W.

The experimental animals were divided into 2 groups: The main group consisted of 2 pigs, in which the effectiveness of various doses of IR diode laser on the erosive and normal mucosa of the esophagus was studied. And the control group consisted of one pig, on the mucous membrane of the esophagus of which dynamic changes in the formed erosion were studied without irradiation.

The main objective of this experiment was to determine the optimal dose of laser irradiation for healing erosions of the esophageal mucosa in pigs.

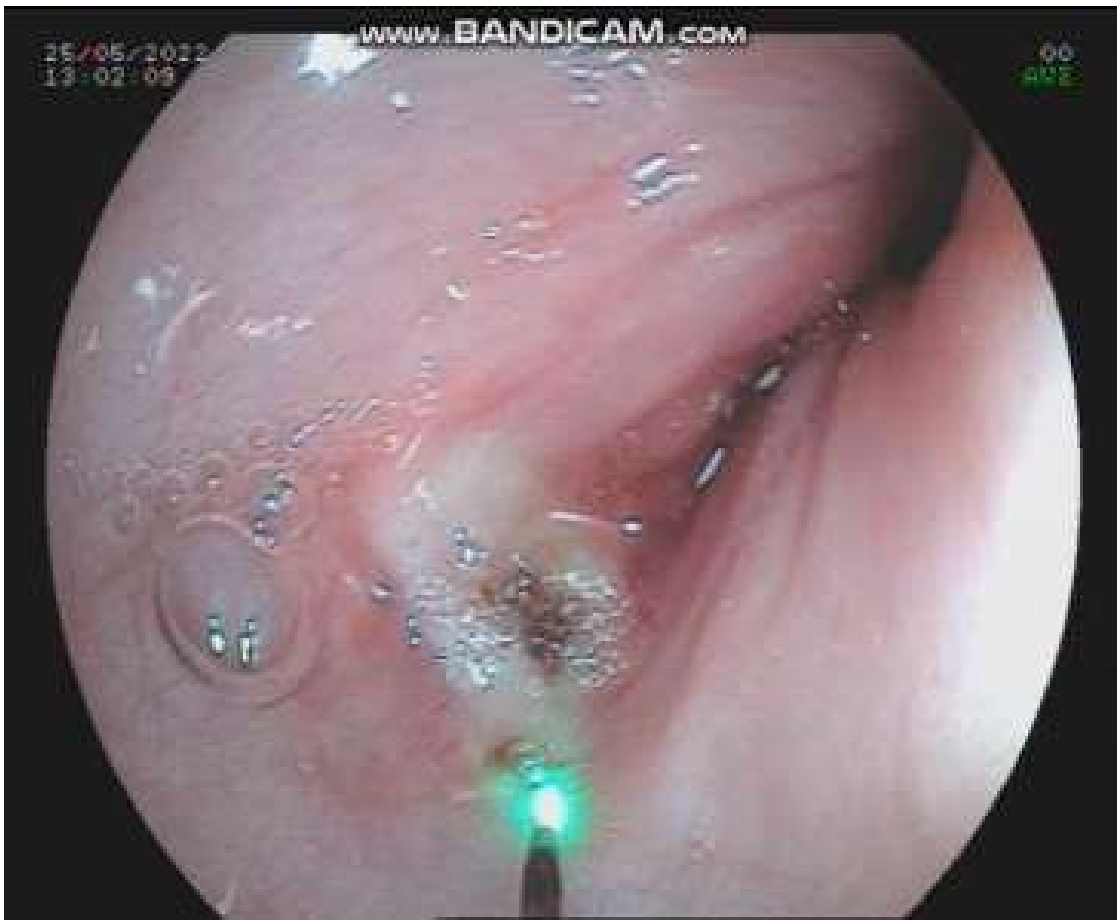
All experiments were carried out under general intubation anesthesia, in compliance with aseptic and antiseptic requirements. After intubation, an endoscope was inserted into the esophagus of the animals (Fig. 3.9) .



Pic. 3.9. Photo illustration of an endoscopic view of normal porcine esophageal mucosa.

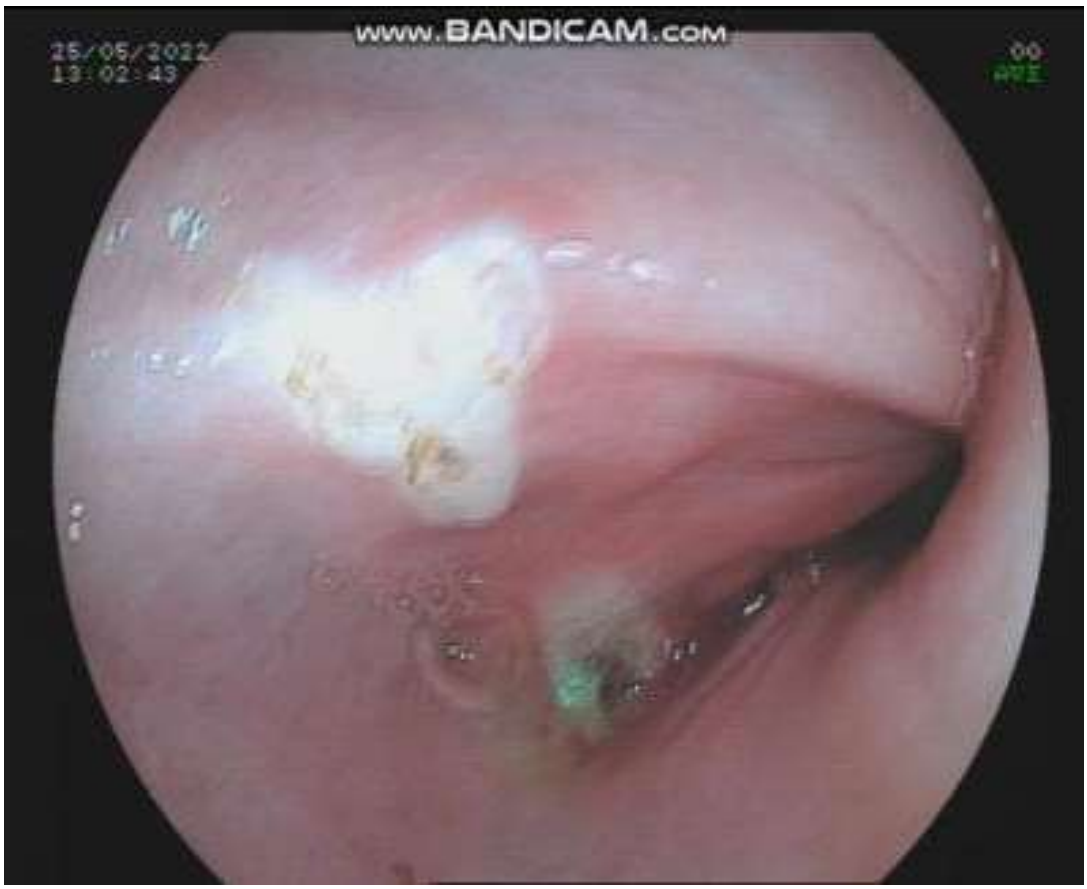
From a distance of 2 cm proximal to the Z -line, an erosion of 0.3-0.5 cm in size was formed on the esophageal mucosa using forceps

A cannula with a light guide from an IR diode laser device (Lakhta-Milon company) was inserted through the instrumental channel. The erosive mucous membrane of the esophagus of 1 animal was exposed to an IR diode laser with an energy force of 212 J, an impact power of 7 W , a wavelength of 970 nm, in pulsed mode, at a distance of 0.5 cm from the tissue. A white edematous circle measuring 1.0 x 1.0 cm in the center with a dark shade measuring 0.3 x 0.4 cm was formed (Fig.3.10).



Pic. 3.10. Photo illustrations of laser radiation of the erosive zone of the esophageal mucosa.

To control the laser effect on the normal mucosa of the esophagus, laser irradiation with the above power parameters was carried out at a distance of about 2-3 cm proximal to the erosion (Fig. 3.11).



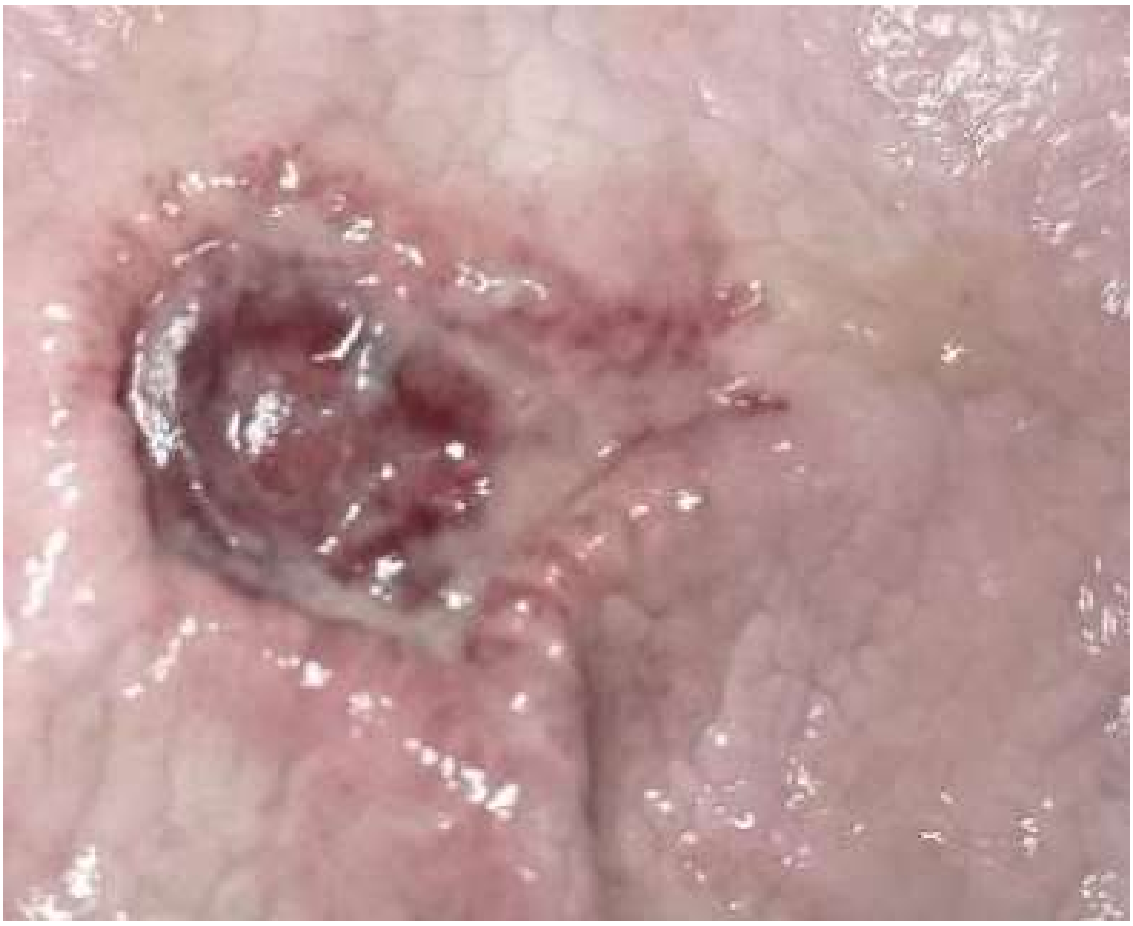
Pic. 3.11. Photo illustration of an endoscopic picture radiation of an IR diode laser on the normal mucous membrane of the pig esophagus.

The mucous membrane of the esophagus of 2 pigs was also exposed to an IR diode laser beam in a pulsed mode, but with a power of 9 W. erosion was formed on the mucous membrane of the esophagus of 3 animals , without exposure to an IR diode laser beam.

On the esophageal mucosa of 1 animal, an increase in the size of the swelling of the erosive mucosa by 1.5x1.5 cm was detected, a change in the color of the erosion with dark pink shades, without signs of bleeding. In the area of irradiation of normal mucosa, an increase in the size of swelling of the mucosa (1.0x1.2 cm) was also detected.

Based on the above signs of illness, the animal was euthanized and necropsied on day 7. For the same reasons, they decided to euthanize and autopsy 2 animals. At autopsy: the external appearance of the esophagus is unchanged, of normal color

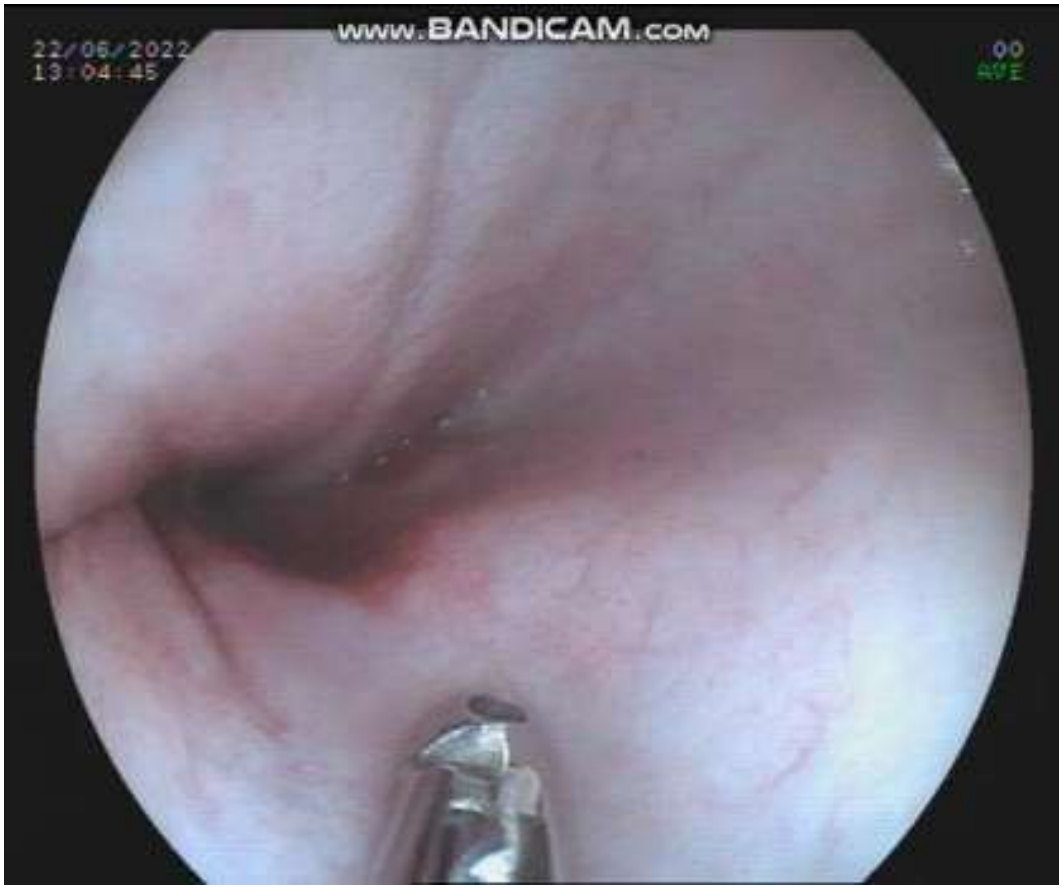
(Fig.3.12). The mucous membrane in the area of the erosive area is edematous, 1.5x1.5 cm in size, with foci of necrosis, a pronounced perifocal inflammatory shaft is revealed on it, with a deepening of the inflammatory process on the submucosa. The place of "normal" mucosa is unchanged.



Pic. 3.12. Photo illustrations of external (a) and internal (b) views of the esophagus of pig 2 on the 7th day after laser irradiation.

On the 14th day of the experiment (3 control endoscopic examination of animals with taking biopsy material) , the general condition of the animals was satisfactory, the appetite was normal, activity was preserved, body temperature was normal, the total weight of the animals was not changed. In 1 animal, endoscopic examination revealed small traces of a dotted nature in the area of erosion, with normal mucosa. In the area of normal mucosa, complete healing of erosion was revealed (Fig. 3.20). In 3 animals (control group), endoscopy revealed a decrease in

the size of erosion (0.5x0.6 cm), but signs of inflammation were preserved. Biopsy materials were taken from all study areas.



Pic. 3.20. Photo illustration of the condition of the erosive mucosa of 1 animal on the 14th day after radiation

CHAPTER IV. ANALYSIS OF THE APPLICATION OF IR-DIODE LASER IRRADIATION IN COMPLEX TREATMENT OF INFLAMMATORY AND DYSPLASTIC CHANGES IN THE ESOPHAGUS MUCOSA

Results of the effectiveness of the use of various endoscopic examinations in the diagnosis and treatment of erosive and dysplastic changes in the mucous membrane of the esophagus.

When assessing the technical capabilities of endoscopic equipment, their technical characteristics were analyzed and the effectiveness of their use in modern hospital conditions was established.

We analyzed the results of a study of 32 patients with complicated forms of GERD who applied to the State Institution “RSNPMCCH named after. acad. V.Vakhidov" (n =19) and the diagnostic department of the Samarkand GMO (n=13).

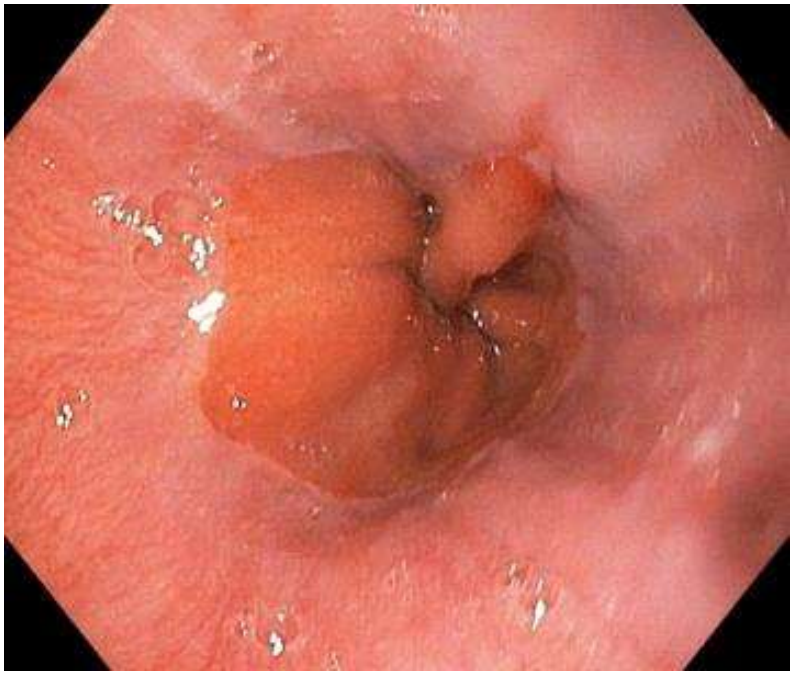
The age of the patients ranged from 25 to 68 years. A significant predominance of female patients was noted: women – 65.6% (n = 21), men – 34.4% (n = 11) of cases. In 8 patients (25.0%) studies were performed initially.

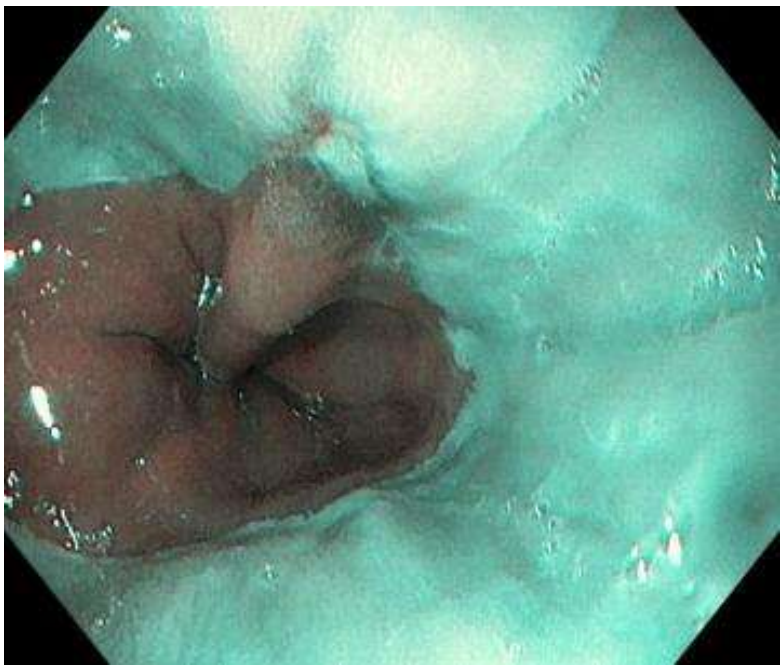
In the endoscopic examination, the emphasis was placed on the color and relief of the mucous membrane, the presence or absence of contents in the esophagus, as well as its quantity, the level and nature of the lower esophageal sphincter, and the presence of the hiatal hernia.

All patients underwent endoscopic examination in normal and narrow-spectrum modes (NBI mode) on an Olympus CV -170 endoscope . In 15 (46.9%) patients, a solution of methylene blue was used for chromoscopy using conventional endoscopes for chromoscopy, which, when applied to the surface of the mucous membrane through a spray catheter, contrasts the surface of the mucous membrane due to denaturation of the surface proteins of the epithelium, and allows for clear

visualization of areas of inflammation, and dysplastic and neoplastic areas cannot be contrasted with this solution, remaining bright red.

The morphological picture of the mucous membrane of the esophagus consists of the mucous membrane and vessels located in the submucosal layer. In Pic. 4.1 illustrates patterns of uneven structure of the esophageal mucosa and pathological blood vessels. When comparing morphological changes in the mucous membrane of the esophagus in patients with BE without areas of dysplasia and normal (normal), a villous-medullary structure of the mucous membrane was revealed in the pathological area.





Pic. 4.1. Endoscopic samples of Barrett's esophagus in normal and narrowspectrum modes (NBI mode).

Biopsy of the pathological area is one of the most important criteria for endoscopic examination. According to the Seattle protocol, a biopsy is taken from four areas, starting with the Z -line and continuing proximally along the area every 2 cm. Biopsy material is removed from the distal and proximal areas of metaplasia.

All patients with Barrett's esophagus disease (n = 10) and suspected neoplasm were referred for additional histological studies. At the same time, adenocarcinoma was detected in 2 (6.2%) patients. Preoperative preparation was carried out according to the standard. In 2 patients with adenocarcinoma with transition to the cardiac part of the stomach, a proximal gastrectomy was performed with resection of the abdominal esophagus and the formation of an end-to-side esophagogastroanastomosis. There were no general complications observed in the postoperative period. Patients were sent for dispensary observation at their place of residence.

In 8 patients, histological examination of biopsy specimens revealed metaplastic changes, in 6 - gastric and in 2 - intestinal metaplasia.

The study included 154 patients (87 men and 67 women) who had complications of GERD such as reflux esophagitis II - IV degrees. Patients, depending on the degree of reflux esophagitis, were distributed according to the Savary - Miller classification . Grade II reflux esophagitis was detected in 107 (69.5%) patients, grade III – in 23 (14.9%) and grade IV – in 24 (15.6%). To assess the prevalence of EC, an endoscopic study found that damage to the abdominal esophagus was observed in 48% of cases, the lower third of the thoracic esophagus - in 39%, and damage to the middle and lower third of the esophagus in 13%.

In 103 (66.9%) patients, various types of hiatal hernia were identified. Depending on the treatment methods performed, the patients were divided into two groups.

The control group consisted of 96 patients, of which 38 (39.6%) received conservative therapy according to the generally accepted method, and 58 (60.4%) received conservative therapy and antireflux surgical interventions (Nissen fundoplication, incomplete fundoplication, and others).

The main group consisted of 58 patients, of which 13 (22.4%) received conservative therapy in combination with the use of an IR diode laser beam , and 45 (77.6%) patients received minimally invasive treatment methods using laparoscopic techniques, as well as conservative therapy with a course of exposure to altered mucous membranes of the esophagus with an IR diode laser beam.

The age of the majority of patients in both the main and control groups ranged from 19 to 44 years, amounting to 30.2% and 23.1%, respectively. The same data were obtained in other age categories.

Table 4.1.

Distribution of patients according to the degree of EC and its complications.

Degree	Control group	Main group	General patients	Credibility
II	68 (70,8%)	39 (67,2%)	107 (69,5%)	χ^2= 0,22, p=0,64
III	14 (14,6%)	9 (15,6%)	23 (14,9%)	χ^2= 0,025, p=0,87
IV:	14 (14,6%)	10 (17,2%)	24 (15,6%)	χ^2= 0,19, p=0,66
a) scar stricture	6	2	8	χ^2= 0,58, p=0,45
b) Barrett's esophagus	3	7	10	χ^2= 4,76, p=0,029
c) Quincke's ulcer	5	1	6	χ^2= 1,17, p=0,28
Total	96	58	154	

Various degrees of reflux esophagitis have been identified in patients with GERD. The study involved only patients with II - IV degrees of reflux esophagitis (Table 4.1)

Analysis of the study showed that in the comparison groups, grade II reflux esophagitis was mainly encountered - in 67.2% (n =39) patients of the main group and in 70.8% (n =68) - control. Thus, the incidence of grade II reflux esophagitis in patients in both groups is significantly the same ($\chi 2$= 0.22, p=0.64).

Reflux esophagitis of the third degree in the comparison groups occurred in 23 (14.9%) patients, of which in the main group – in 9 (14.6%) and in the control group – in 14 (15.6%). Thus, the incidence of grade III reflux esophagitis in both groups is also significantly the same ($\chi 2$= 0.025, p=0.87).

IV reflux esophagitis was diagnosed in 24 (15.6%) patients, of which 10 (17.2%) were in the main group, and 14 (14.6%) were in the control group. The statistical significance of grade IV reflux esophagitis in the comparison groups was $\chi 2$= 0.19, p=0.66 . At the same time, the incidence of BE disease in the study showed a significant significant difference, which amounted to $\chi 2$ = 4.76, p = 0.029, compared with other complications of reflux esophagitis IV degree .

When prescribing conservative therapy, standard drugs are recommended for all patients in the comparison groups: antisecretory drugs (H2 - histamine blockers, PPIs), prokinetics, antacids, anti-regurgitants, as well as macrolide antibiotics according to indications.

38 patients in the control group, after therapy, were examined during the prescribed periods. During the control examination, endoscopic examinations were used to assess the condition of the mucous membrane of the cardioesophageal junction and esophagus.

Before surgical treatment aimed at eliminating the reflux of gastric contents into the esophagus, conservative treatment was carried out aimed at reducing inflammatory changes. In the postoperative period, treatment was carried out with an IR diode laser beam, according to the method we developed.

All 103 (66.9%) patients of both comparison groups underwent surgical interventions: posterior crurorrhaphy and Nissen or Toupet fundoplication laparoscopically using 4-5 ports at standard points under general endotracheal anesthesia.

Surgical intervention began with revision of the abdominal organs. The "tunnel" for the fundoplication cuff was formed behind the esophagus using a sharp and blunt method. Posterior crurorrhaphy was performed using interrupted sutures using 3.0 Etibond thread. The fundus of the stomach was passed behind the esophagus through a "tunnel". The cuff was sutured with 2/0 Vicryl threads using 3-4 separate interrupted Nissen or Toupet sutures. In this case, one suture of the cuff was necessarily fixed to the esophagus to prevent slipping .

If patients had concomitant pathology (chronic calculous cholecystitis - 5 (4.9%) patients or umbilical hernia - 2 (1.9%) simultaneous operations were performed.

In 1 (0.9%) patient, laparoscopy was converted to conversion (upper midline laparotomy). The reason for the conversion was a massive adhesive process of the hernial chamber in the mediastinum .

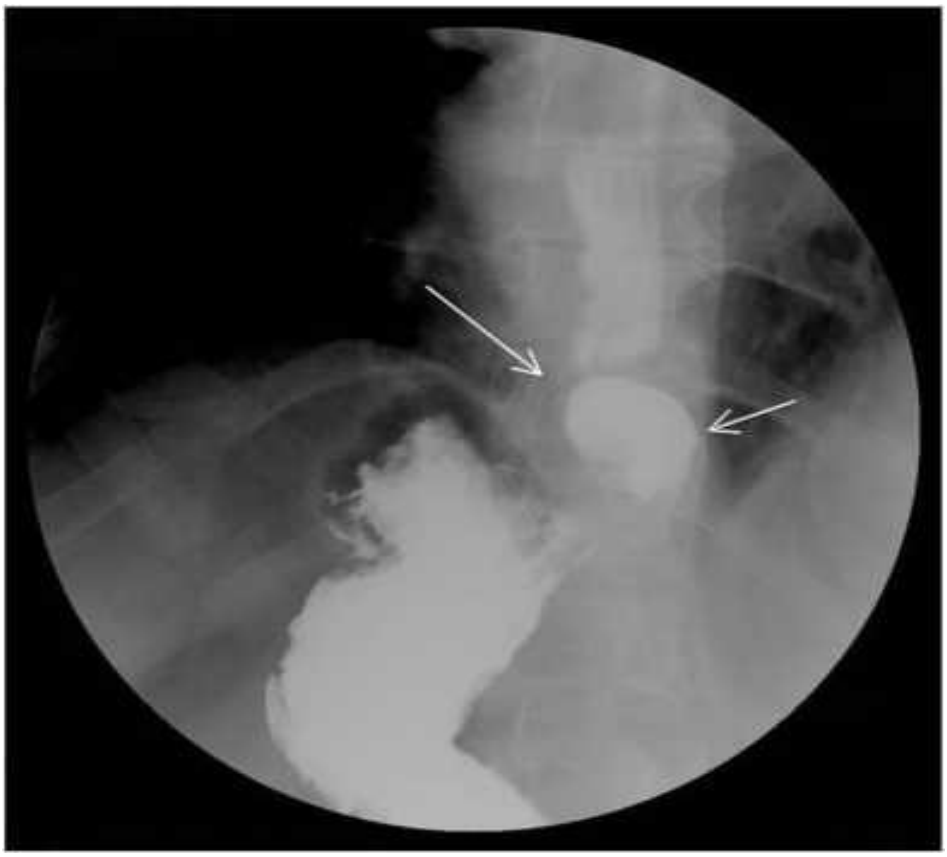
The average duration of all operations was 121.2±10.5 minutes. There were no complications noted in the immediate postoperative period. The average postoperative bed-day was 5.5±0.6. When performing a conversion – 9 days.

Clinical example: Patient M, born in 1981, IB No. 12347, was hospitalized on 10/06/2022 in the second surgical department (endosurgery) of the Samarkand GMO with complaints of constant heartburn, epigastric pain, belching and regurgitation.

According to his medical history, he considers himself ill for approximately 6-7 years; he was independently treated conservatively several times, but the effect of treatment lasted 1-2 months.

The patient was fully examined according to the standard. On contrast radiography (Fig. 4.3): in a vertical position, the esophagus is freely passable, in the lower parts of the esophagus, peristalsis moderately slows down, there is a slight

regurgitation of the stomach contents into the esophagus; in a horizontal position, these signs are more pronounced. Conclusion: Axial hiatal hernia.



Pic. 4.3. Contrast radiography of the gastrointestinal tract in a horizontal position.

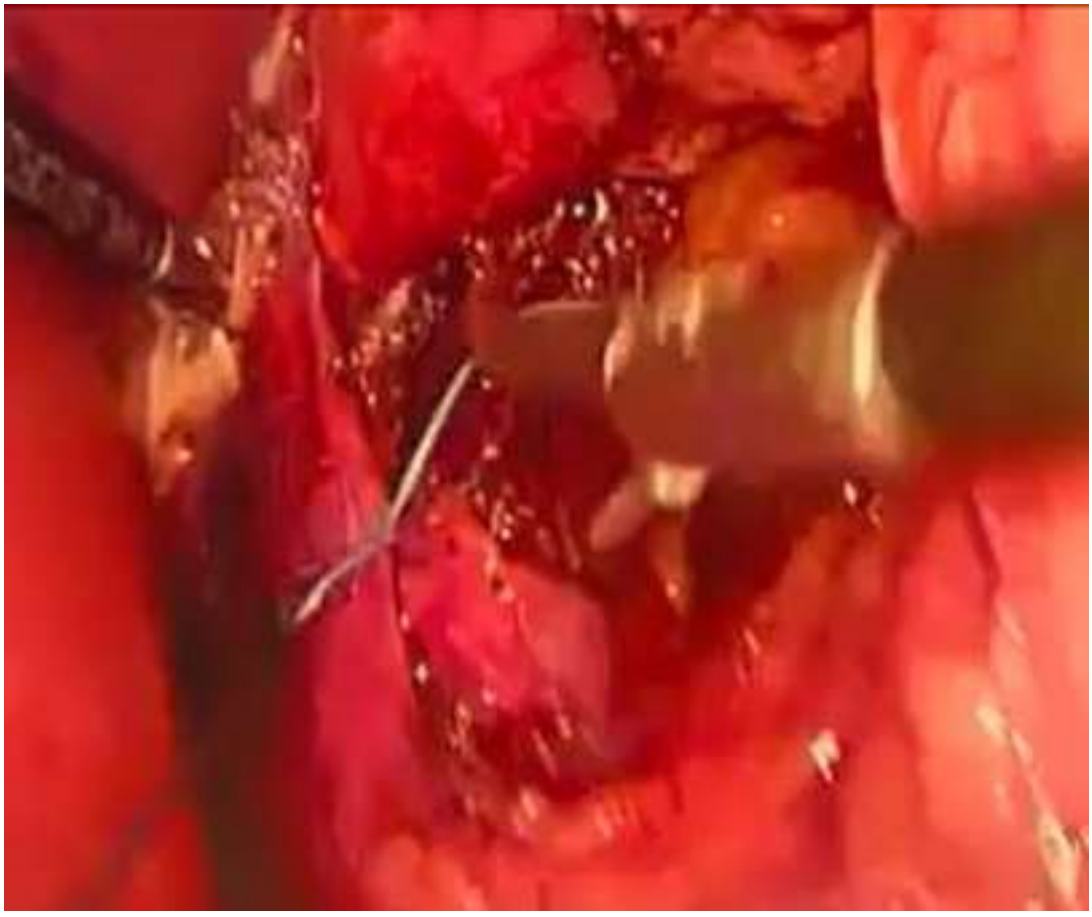
At EGDFS (07.10.2022): the mucous membrane of the esophagus is hyperemic, there are erosions with a diameter of up to 0.7 cm. A hiatal hernia, stage I , size 3 cm, with a length of the esophagus of 22-23 cm from the incisors, complicated by reflux esophagitis stage II - III . Diffuse catarrhal gastritis.

The patient was diagnosed with Axial hernia. Gastroesophageal reflux disease. Reflux esophagitis II-III degree.

On 10/08/2022, an operation was performed under general endotracheal anesthesia: laparoscopic crurorrhaphy. Nissen fundoplication. The patient has a 32 Fr nasogastric tube installed . Incisions were made through standard points and trocars were inserted (10 mm - in the left hypochondrium 2 cm below the edge of the costal arch, 5 mm - in the epigastrium, 10 mm - in the right hypochondrium 2-3

cm below the edge of the costal arch, 10 mm - in the left lateral region along the mid-axillary line).

Next, mobilization of the upper part of the stomach and the fundus along the greater curvature was carried out along the lesser curvature. In this case, theesophageal-diaphragmatic and gastrophrenic ligaments were dissected. A tunnel for the fundoplication cuff was formed behind the esophagus using a sharp and bluntmethod. Posterior crurorrhaphy was performed with interrupted sutures using 3.0 Etibond thread (Fig. 4.4).



Pic. 4.4. Stage of the crurorrhaphy operation.

Then, the fundus of the stomach was passed behind the esophagus through a tunnel. And the edges of the cuff were sutured with 3-4 separate interrupted sutures using Vicryl threads of size 2/0 (Fig. 4.5). The operation was completed with drainage of the abdominal cavity.

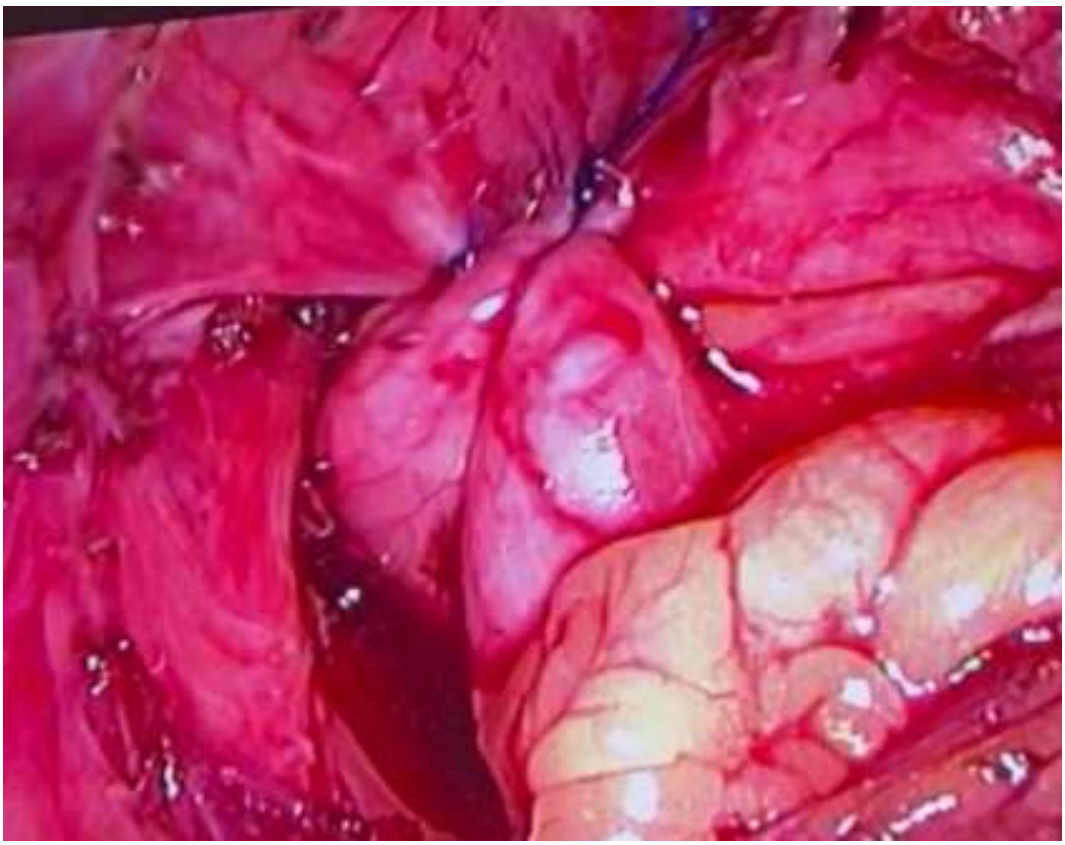


Fig . 4.5. Stage of formation of the fundoplication cuff.

The patient was activated one day after the operation. The patient was discharged after 3 days in satisfactory condition.

The complex treatment of the patient included treatment with an IR diode laser beam, and conservative therapy was recommended for complete regression of theesophageal mucosa.

Treatment of pathological conditions of the mucous membrane of the esophagus with an IR diode laser beam

Exposure to an IR diode laser beam was carried out on an outpatient or inpatient basis using an IR diode laser device from Lakhta-Milon. After irrigating the throat with 10% lidocaine, the patients had an endoscope inserted orally into the esophagus. When endoscopically detected erosive and ulcerative changes in the mucous membrane of the esophagus, biopsy material was taken with forceps for subsequent histological examination. A cannula with a light guide from an IR diode

laser device (Lakhta-Milon company) was inserted through the instrumental channel. The eroded part of the mucous membrane of the esophagus was exposed at a distance of 0.5 cm from the wall of the esophagus with an IR diode laser beam with a wavelength of 970 nm, an output power at the end of the light guide of 7 W, a total dose of 212 J, in a pulsed radiation mode, with exposure times of 2 sec.

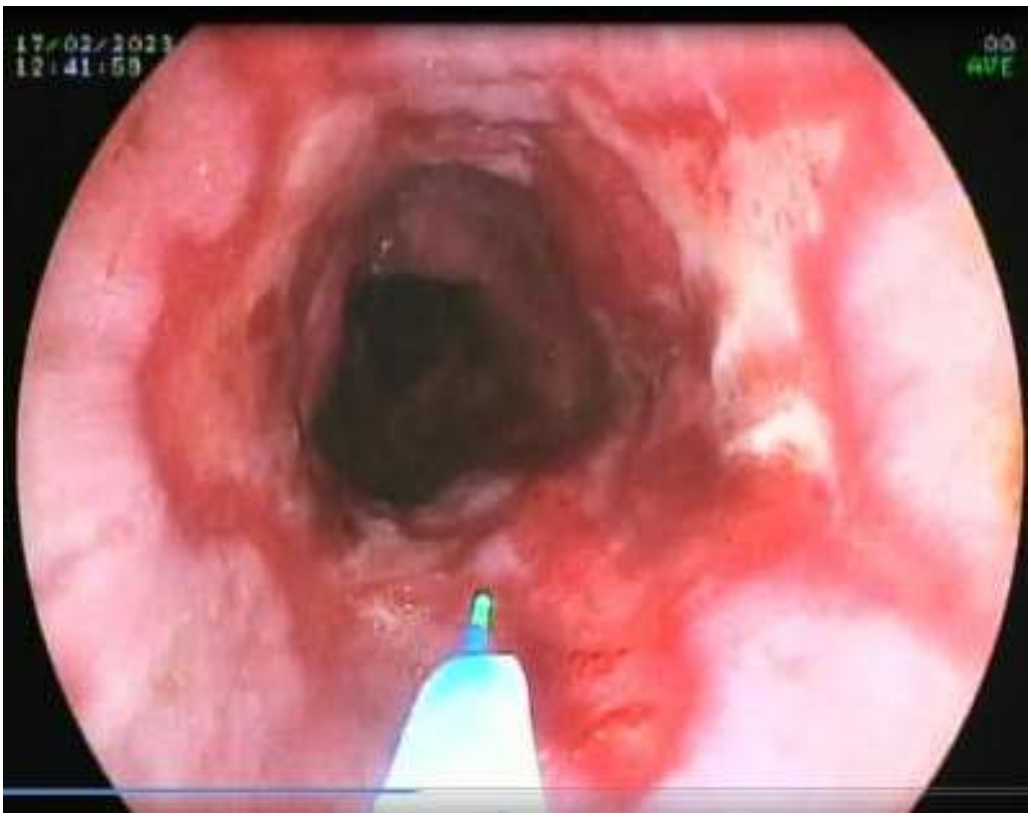
At the end of exposure to the laser beam, the endoscope with the light guide was removed from the esophagus. The patient was prescribed standard conservative treatment, which included the use of proton pump inhibitors, H2-histamine blockers, and cytoprotectors. The study was repeated after 20-30 days. If necessary, a repeat session of laser therapy through an endoscope was prescribed.

Clinical example 1.

Patient J., 57 years old, on September 26, 2022, went to the clinic of the State Institution “RSNPMCCH named after. acad. V. Vakhidova" with complaints of pain in the epigastric region, constant heartburn, nausea, vomiting, weight loss. Considers himself sick for 10 years. She was treated conservatively several times, but after 2-3 months the symptoms recurred.

The patient underwent an EGDF examination: the distal part of the mucous membrane of the esophagus was hyperemic, erosive areas with a diameter of up to 0.8 cm were noted, the picture of “tongues of flame” was suspected of esophageal metaplasia. The patient underwent a control endoscopic examination in NBI mode: dystopic segments of the epithelium up to 6.0 cm in size were found above the Z - line. EGDFS conclusion: Hiatal hernia of the 1st degree, hernia size 4 cm, with a length of the esophagus of 20-21 cm from the incisors, Reflux esophagitis degree IV.

Barrett's esophagus. Dystopia of the gastric mucosa on the esophagus up to 6 cm in length. Diffuse catarrhal gastritis. Biopsy material was taken for histological examination. Results of histological examination No. 7019-7020: Barrett's esophagus with symptoms of gastric metaplasia and severe internalization.



Pic. 4.6. Image of laser irradiation of the metaplastic area of the esophagus.

Taking into account complications (PB), the patient was recommended for surgical treatment, which she refused. Thus, the patient underwent the first course of exposure to an IR diode laser beam (Fig. 4.6). The patient was recommended standard conservative treatment and re-examination in a month.

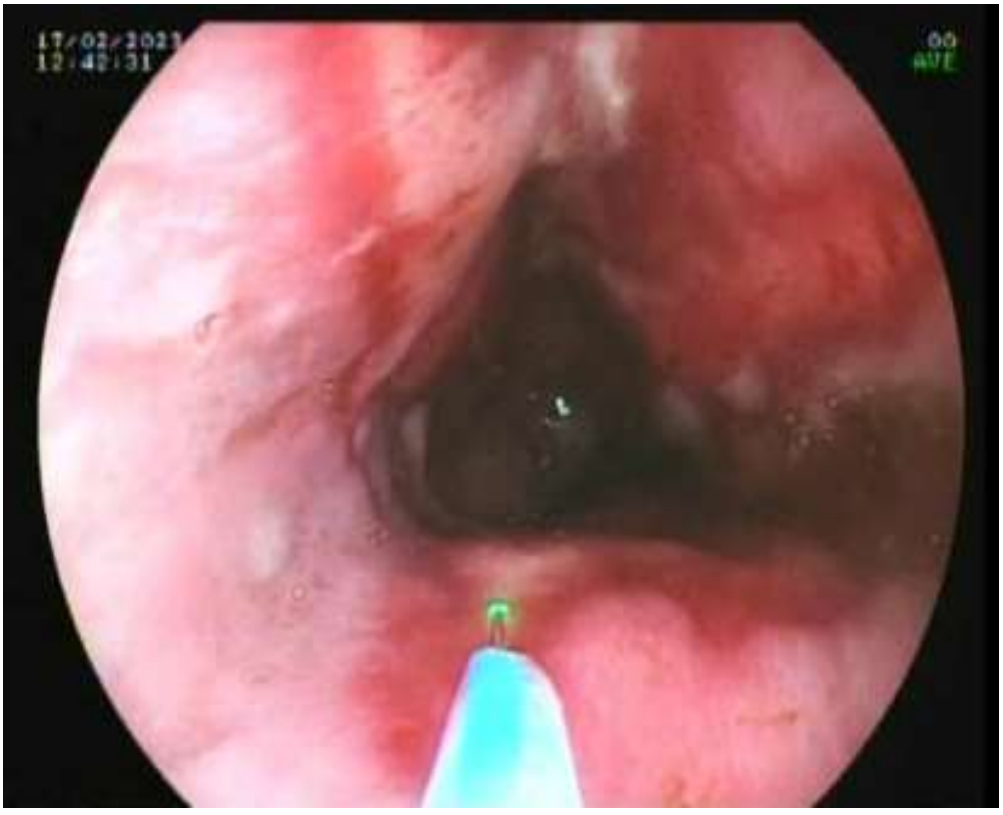
November 14, 2022, i.e. after 48 days, patient J. returned to the clinic of the State Institution “RSNPMCCH named after. acad. V.Vakhidov.” Over time, her complaints have decreased significantly. The general condition has improved. The patient underwent a control EGDF examination. An endoscopic examination revealed a decrease and shortening in the size of the erosive areas. Conclusion: Hiatal hernia measuring 4 cm, with a length of the esophagus of 20-21 cm. Complication: Reflux esophagitis of II - III degree. Superficial gastritis. The patient was given a second course of diode laser radiation; continuation of conservative treatment and reexamination after 2 months were recommended.

Clinical example 2.

Patient N., 80 years old, on November 1, 2022, went to the clinic of the StateInstitution “RSNPMCCH named after. acad. V. Vakhidov" with complaints of pain in the chest area, constant heartburn, nausea, vomiting, hiccups, and general weakness.

Considers himself sick for 10-15 years. I was treated conservatively several times, but the effect after conservative therapy lasted about 5-6 months.

The patient underwent an EGDF examination: Hiatal hernia measuring 9-10 cm, with a length of the esophagus of 20-21 cm. Complication: Reflux esophagitis of the IV degree. Barrett's esophagus. Dystopia of the gastric mucosa on the esophagus with a length of 10 cm.” Samples of biopsy material were taken from the zone of dystopia and hyperplasia. Conclusion of histological study No. 7934-7935: Apoptosis of the esophageal epithelium. Due to age restrictions, concomitant pathologies and high operational and anesthetic risk, the patient was recommended conservative and laser treatment. The patient underwent the first course of diode laser radiation (Fig.4.7), standard conservative treatment and repeated examination for 15 days were recommended.



Pic. 4.7. A snapshot of the endoscopic picture of laser irradiation.

On November 16, 2022 (15 days after the first course), patient N. returned to the clinic of the State Institution “RSNPMCCH named after. acad. V.Vakhidov.” Over time: there was a significant decrease in complaints and an improvement in general condition. The patient underwent a control EGDF examination: Hiatal hernia measuring 9-10 cm, with a length of the esophagus of 20-21 cm, Improvement in the picture of reflux esophagitis - reflux esophagitis of the III degree. The patient received a repeated course of IR diode laser radiation. Preparation for surgical treatment and re-examination in a month are recommended.

Summary. All patients with GERD complicated by reflux esophagitis of II - IV degrees are recommended for complex treatment. For surgical treatment of patients with GERD complicated by Barrett's esophagus, laparoscopic Nissen or Toupet fundoplication is indicated.

In addition, the complex treatment included the endoscopic use of an IR diode laser with beam exposure to the altered mucous membrane of the esophagus, as wellas standard conservative therapy.

As part of the study, a diagnostic and treatment algorithm and program (DGU No. 21837) was developed for patients with GERD complicated by erosive changes in the esophageal mucosa. The patients' responses were assessed by points, the number of which makes it possible to determine the following tactics.

Results of complex treatment of pathological conditions of the esophageal mucosa using an infrared diode laser beam

The impact of an IR diode laser beam on the mucous membrane of the esophagus was carried out in patients using a laser device from Lakhta-Milon on an outpatient and inpatient basis. IR diode radiation was carried out through an endoscope with a wavelength of 970 nm, at a power of 5-7 W, with an energy of 212 J, in pulsed mode. A control study was carried out after 20-28 days of treatment.

The effectiveness of treatment results was assessed based on patient complaints and endoscopic examinations. To identify the research results, a questionnaire was developed .

The studies showed that in both the main and control groups, the most common symptoms were heartburn, belching, pain in the epigastric and retrosternal areas, regurgitation and nausea. To determine the full reliability, we studied all types of complaints before treatment and one month after treatment. Some of the complaints are presented in Table 4.2.

Table 4.2.

Frequency of dyspeptic symptoms in patients before and after treatment

Symptom	Main group		Control group	
	% before treatment	% after treatment	% before treatment	% after treatment
Heartburn	95,4	12,8	94,2	32,4
Belching	70,4	15,1	69,2	35,2
Epigastric pain	53,1	6,3	54,8	21,8
Pain behind the sternal	48,9	7,2	49,8	25,7
Regurgitation	25,8	5,1	26,9	17,1
Nausea	32,4	7,1	34,6	19,7

When studying the main complaints, it was found that before the study, heartburn occurred in 95.4% of patients in the main group and in 94.2% of patients

in the control group, i.e. the incidence rate of heartburn in the comparison groups is almost the same ($\chi 2 = 0.076$, $p = 0.78$).

In patients of the main group after treatment, it was possible to significantly reduce the incidence rate from 95.4% to 72.6% ($\chi 2 = 79.8$, $p < 0.05$). Also, in patients in the control group this indicator decreased by 61.8% ($\chi 2 = 77.8$, $p < 0.05$). Thus, the symptom of heartburn in patients after complex treatment was significantly ($\chi 2 = 7.96$, $p = 0.0048$) reduced (32.4% versus 12.8%, respectively).

The second most common complaint was belching. The incidence of belching in the comparison groups was significantly the same ($\chi 2 = 0.064$, $p = 0.8$).

Upon completion of complex treatment using an IR diode laser beam in the main group, the indicator was significantly reduced ($\chi 2 = 36$ $p < 0.05$) from 70.4% to 55.3%. And in the control group this figure decreased from 69.2% to 34% ($\chi 2 = 21.37$, $p < 0.05$).

Thus, in this case, it was noted that the symptom of belching in patients after complex treatment was significantly ($\chi 2 = 7.11$, $p = 0.0076$) reduced (35.2% versus 15.1%, respectively). The next most common complaint was pain in the epigastric region. The incidence of epigastric pain in the comparison groups was the same ($\chi 2 = 0.045$, $p = 0.83$).

Upon completion of complex treatment using an IR diode laser beam in the main group, it was possible to significantly ($\chi 2 = 9.83$, $p < 0.05$) reduce the rate by 46.8%. In the control group, epigastric pain decreased by 23% ($\chi 2 = 22.52$, $p < 0.05$).

Also in this case, in patients after complex treatment it was possible to significantly ($\chi 2 = 5.96$, $p = 0.015$) reduce epigastric pain (21.8% versus 6.3%, respectively).

The fourth complaint is chest pain. The incidence of chest pain in the comparison groups was also significantly the same ($\chi 2 = 0.043$, $p = 0.84$). In the main group, after complex treatment, this indicator was significantly ($\chi 2 = 24.86$, $p < 0.05$) reduced by 46.8%. And in the control group, chest pain decreased by 33% ($\chi 2 = 11.69$, $p < 0.05$). Thus, in this case, retrosternal pain in patients after complex

treatment was significantly ($\chi 2 = 8.67$, $p = 0.003$) reduced (25.7% versus 7.2%, respectively).

Complaints of regurgitation before the study occurred in 25.8% of patients in the main group and in 26.9% of patients in the control group. In patients in the control group, this indicator decreased by 9.8% ($\chi 2=3.05$, $p =0.04$).

Based on the indications, in patients after complex treatment it was possible to significantly reduce the indicator ($\chi 2=4.42$, $p=0.036$) (17.1% versus 5.1%, respectively). In addition, patients in the comparison groups complained of nausea equally ($\chi 2=0.042$, $p =0.84$).

After complex treatment in the main group, the indicator was significantly ($\chi 2=12.2$, $p =0.0002$) reduced by 25.3%. In the control group, nausea decreased by 14.9% ($\chi 2=5.17$, $p =0.011$). Thus, the rate of nausea in patients after complex treatment was significantly ($\chi 2=4.73$, $p=0.03$) reduced (19.7% versus 7.1%, respectively).

A control endoscopic examination was recommended for all ($n = 154$) patients in the comparison groups at the end of treatment, one month later.

A control endoscopic examination revealed an improvement in the erosive pattern of the esophageal mucosa in 13 (22.4%) patients of the main group.

Improvement in the erosive pattern was mainly observed in patients with degree II reflux esophagitis (Table 4.3).

In 11 (14.4%) patients in the control group, improvement in pathologies of the esophageal mucosa was detected after antireflux operations . Patients from the main group with an unchanged picture of reflux esophagitis underwent repeated complex treatment, including exposure to an IR diode laser beam and drug therapy.

Table 4.3.

Condition of the esophageal mucosa in patients after 1 treatment session.

Complications of GERD	Main group (n=58)		Control group (n=96)		
	before treatment	after treatment	before treatment	after treatment	
without esophagitis	-	5 (8,6%)	-	1 (1,1%)	χ^2=5.55, p=0.019
I st.	-	8 (13,8%)	-	10 (10,4%)	χ^2=0,4, p=0.53
II st.	39 (67,2%)	28 (48,3%)	68 (70,8%)	57 (59,4%)	χ^2=1.8, p=0.18
III st.	9 (15,6%)	7 (12,1%)	14 (14,6%)	14 (14,6%)	χ^2=0.19, p=0.66
IV st..	10 (17,2%)	10 (17,2%)	14 (14,6%)	12 (12,5%)	χ^2=0.66, p=0.42

In 2 patients of the control group, adenocarcinoma of the esophagus with transition to the cardiac part of the stomach was detected. The patients underwent resection of the proximal stomach and abdominal esophagus with the formation of an end-to-side esophagogastroanastomosis.

A month after the 1st session, the patients underwent a repeat endoscopic examination. Repeated endoscopic examination revealed an improvement in the erosive pattern of the esophageal mucosa in 33 (56.9%) patients of the main group. In the control group, this indicator was detected only in 15 (15.6%) patients.

These were mainly patients with reflux esophagitis of degrees II and III (Table 4.4). There were significantly more patients with no signs of esophagitis in the main group ($\chi 2=9.58$, $p=0.002$) - 9 (15.6%) than in the control group - 2 (2.1%). The results in patients with grade I reflux esophagitis after 2 sessions in the main group also differ significantly ($\chi 2=6.54$, $p=0.01$) (31%) from the results in the control group (13.5%).

Table 4.4.

Condition of the esophageal mucosa in patients after 2 and 3 treatment sessions.

Complications of GERD	Main group (n=58)		Control group (n=96)			
	after 2-course	after 3-course	after 2-course	after 3-course	after 2-course	after 3-course
without esophagitis	9 (15,6%)	12 (20,7%)	2 (2,1%)	3 (3,1%)	$\chi^2=9.58$, $p=0.002$	$\chi^2=12.35$, $p=0.0004$
I st	18 (31%)	23 (39,7%)	13 (13,5%)	14 (14,6%)	$\chi^2=6.54$, $p=0.01$	$\chi^2=11.94$, $p=0.0005$
II st	16 (27,5%)	15 (25,9%)	56 (58,3%)	55 (57,3%)	$\chi^2=14.7$, $p=0.0001$	$\chi^2=15.4$, $p=0.0001$
III st	8 (13,8%)	6 (10,3%)	11 (11,4%)	10 (10,4%)	$\chi^2=0.14$, $p=0.7$	$\chi^2=0.003$, $p=0.95$
IV st.	7 (12,1%)	2 (3,4%)	12 (12,5%)	12 (12,5%)	$\chi^2=0.016$, $p=0.9$	$\chi^2=3.72$, $p=0.05$

To improve the condition of the erosive pattern of the esophageal mucosa, patients were recommended to repeat the third session of complex treatment after endoscopic examination a month later.

In patients with grade IV reflux esophagitis, after 3 sessions of complex treatment, it was possible to significantly ($\chi 2=3.72$, $p=0.054$) improve the condition of the esophageal mucosa - 12.5% versus 3.4% (Table 5.4). In 2 (3.4%) patients of the main group with Barrett's esophagus and a large amount of mucosal metaplasia, radical surgical treatment was recommended.

As the results of the study showed, 33 (56.9%) patients, who made up the majority, underwent 2 sessions of exposure to an IR diode laser beam, 13 (22.4%) - 1 session, and 12 (20.7%)) required 3 sessions of exposure to an IR diode laser beam to improve the erosive pattern of the esophageal mucosa. One session of IR diode laser radiation averaged 1.05±0.16 minutes.

During exposure to the IR diode laser beam and after the procedure, the patients did not feel pain symptoms, did not need to take analgesics, and did not have other complications (esophageal perforation, bleeding, etc.).

And restoration of microcirculation accelerates self-regeneration and promotes rapid wound healing.

Summary. Studies have shown that when laser therapy is connected to complex treatment (conservative + surgical + laser) of erosive-inflammatory complications of GERD, there is an improvement in the condition of the mucous membrane of the esophagus, a decrease or disappearance of dyspeptic symptoms in the esophagus, a therapeutic effect of up to 95% is achieved versus 69% with the use of standard conservative therapy.

Thus, the effectiveness and accessibility of the method allows us to recommend it for use in endoscopic surgery in the treatment of patients with GERD.

CONCLUSION

In recent years, interest in the problem of gastroesophageal reflux disease of the esophagus and hiatal hernia has increased. In terms of frequency, they occupy a leading position among diseases of the digestive tract after cholecystitis of a calculous nature , peptic ulcer of the stomach and duodenum. GERD may not affect a person's life expectancy, but it will lead to a deterioration in its quality.

Today, one of the most pressing problems of modern endoscopy and endosurgery is to improve and develop different methods for diagnosing and treating complications of GERD.

An analysis of the treatment of 154 patients with GERD complicated by stage IIIV reflux esophagitis, who were in the department of thoracoabdominal oncosurgery, outpatients of the polyclinic-diagnostic department of the State Institution "RSNPMCCH named after Academician V. Vakhidov" and in the diagnostic department of the Samarkand GMO (2023-2024) was carried out. .

When distributing patients depending on the degree of reflux esophagitis, we used the Savary - Miller classification : stage II reflux esophagitis in 107 (69.5%), degree III in 23 (14.9%), and degree IV in 24 (15.6%) patients.

In 103 (66.9%) patients, hiatal hernias of various types were detected. For patients in this category, we used the classification according to SAGES (2013), which includes 4 types of hiatal hernia.

I hernias (sliding hiatal hernia) were diagnosed in 85 (82.5%) of 103 patients, of which esophageal hernias were in 3 (2.9%), cardiac - in 78 (75.7%) and cardiofundal - in 4 (3.9%) patients. A short esophagus of grade I was found in 11 (10.7%), grade II in 6 (5.8%) and normal length of the esophagus was in 68 (66%) patients.

Type II hernias (true paraesophageal hernias) were diagnosed in 2 (1.9%) of 103 patients. Type III hernias (a combination of types I and II) were diagnosed in 16 (15.6%) patients, with subtotal gastric hernias in 2 (1.9%) patients. Type IV hernia was not detected in our study patients.

All patients underwent a set of standard diagnostic methods in order to establish the correct underlying disease and concomitant pathology. For diagnosis, we mainly focused on endoscopic examination.

EGDFS was carried out with an endoscope from FUJINON FUJIFILM System 2500 Processor (Japan), as well as with an Olympus endoscope (Japan) with the ability to study in NBI mode , which has several advantages over a conventional endoscope, which provides more informative data in the diagnosis of erosive and dysplastic changes in the esophageal mucosa .

The studies were carried out at the training center of the Department of Experimental Surgery of the State Institution “RSNPMCCH named after. Academician V.Vakhidov." To fully identify the effects of IR diode laser beams on the mucous membrane of the esophagus, different animal species (rodents, mammals) participated in the experiment.

The main objectives for conducting a series of experimental and morphological studies were to determine the optimal effective dose and time of exposure, as well as the effect of the distance of exposure of IR diode laser beams on the esophageal mucosa of rats and pigs for the healing of erosions of the esophageal mucosa .

The results of this study made it possible to recommend the most optimal options for using IR diode laser effects when used in the surgical treatment of GERD complicated by pathological conditions of the esophageal mucosa.

The experiments were carried out on 3 pigs of 5 months of age, weighing 30-32 kg, and 42 whiteoutbred rats weighing 180-230 grams were also used. To study the voltage and time interval of IR diode laser beams in the esophageal mucosa of rats and pigs, as well as the distance of the light device relative to the tissue, we conducted several step-bystep experiments.

Experimental animals were divided into different equal groups. In all groups, irradiation was carried out in a certain mode of various dosages, distance and time in the area of previously artificially damaged part (area of erosions). Euthanasia of animals was carried out by drug overdose.

Tissue samples were taken. For light microscopy, tissue was fixed in a 10-12% formaldehyde solution in Lilly phosphatebuffer. Paraffin sections were stained with hematoxylin-eosin.

Based on the results of experiments on rats, it can be said that when exposed to IR diode laser irradiation with an energy force of 212 J, an impact power of 5 W at a distance of 0.5 cm from the tissue for 2 seconds on the erosive mucous membrane ofthe esophagus of white rats, hyperemia and swelling of the mucosa are initially observed shells.

After 5-7 days of observation, the mucous membrane is completely restored. It should be noted that laser exposure by contact is impractical, because 4-5 days after the operation, perforation of the esophagus is observed, which leads to the death of rats.

Depending on the treatment methods performed, the patients were divided into two groups. The main group consisted of 58 patients, of which 13 (22.4%) received conservative therapy in combination with the use of an IR diode laser beam, and 45 (77.6%) patients received minimally invasive treatment methods using laparoscopic techniques, as well as conservative therapy with a course of exposure to altered mucous membranes of the esophagus with an IR diode laser beam.

For conservative therapy, our patients were recommended standard drugs:antisecretory drugs (H 2 -histamine blockers, PPIs), prokinetics, antacids, and, if indicated, macrolide antibiotics.

All patients underwent laparoscopic crurorrhaphy, Nissen or Toupet fundoplication. In 1 patient (1.7%) conversion was required after the laparoscopic approach. The reason for the conversion was a massive adhesive process of the hernial chamber in the mediastinum.

IR diode laser radiation was carried out in inpatient and outpatient settings using an IR diode laser device from Lakhta-Milon. IR diode laser radiation was used in a pulsed mode with an irradiation power of 5 and 7 W , an energy force of 212 J, and a wavelength of 970 nm. 33 (56.9%) patients, who made up the majority, underwent 2 sessions of exposure to an IR diode laser beam, 13 (22.4%) - 1 session,

and 12 (20.7%) required 3 sessions exposure to an IR diode laser beam to improve the erosive pattern of the esophageal mucosa.

One session of IR diode laser radiation averaged 1.05±0.16 minutes. During exposure to the IR diode laser beam and after the procedure, the patients did not feel pain symptoms, did not need to take analgesics, and did not have other complications (esophageal perforation, bleeding, etc.).

The effectiveness of treatment results was assessed based on patient complaints and endoscopic examinations. When studying the main complaints, it was found that before the study, heartburn occurred in 95.4% of patients in the main group and in 94.2% of patients in the control group, i.e. the incidence rate of heartburn in the comparison groups is almost the same ($\chi 2= 0.076$, $p = 0.78$).

After complex treatment, the symptom of heartburn in patients was significantly ($\chi 2=7.96$, $p =0.0048$) reduced (32.4% versus 12.8%, respectively). And belching significantly ($\chi 2 = 7.11$, $p =0.0076$) decreased from 35.2% to 15.1%. And also, other complaints were considered, such as pain in the epigastrium and chest, nausea and regurgitation.

According to endoscopic studies , after 1 session of complex treatment it was possible to significantly ($\chi 2= 5.55$, $p= 0.019$) improve the condition of the esophageal mucosa in patients from 10.5% to 22.4%.

After 2 sessions, there were significantly more patients with no signs of esophagitis in the main group ($\chi 2=9.58$, $p=0.002$) - 9 (15.6%) than in the control group - 2 (2.1%). The results in patients with grade I reflux esophagitis after 2 sessions in the main group also differ significantly ($\chi 2=6.54$, $p=0.01$) (31%) from the results in the control group (13.5%).

After the 3rd session, esophageal mucosa with signs without esophagitis was significantly ($\chi 2= 12.35$, $p= 0.0004$) identified in the main group in more cases (20.7%) than in the control group (3.1%).

And also, patients with stage I. reflux esophagitis was also detected significantly ($\chi 2$= 11.94, p= 0.0005) more in the main group (39.7%) cases than in the control group (14.6%).

Studies have shown that when laser therapy is connected to complex treatment (conservative + surgical + laser) of erosive-inflammatory complications of GERD, there is an improvement in the condition of the mucous membrane of the esophagus, a decrease or disappearance of dyspeptic symptoms in the esophagus, a therapeutic effect of up to 95% is achieved versus 69% with the use of standard conservative therapy. Thus, the effectiveness and accessibility of the method allows us to recommend it for use in endoscopic surgery in the treatment of patients with GERD.

CONCLUSIONS

1. In a study of patients with GERD, reflux esophagitis stage II. detected in 69.5% of patients, stage III. in 14.5% and IV stage. diagnosed in 15.6% of patients. No statistically significant differences were determined between the compared groups ($p > 0.05$).

2. For diagnosing erosive and inflammatory changes in the mucous membrane of the esophagus, the endoscopic method with the NBI mode is the most informative method, which has additional capabilities than an endoscope in normal mode using chromoscopy.

We used the NBI regimen in 32 patients of both groups. Of these, Barrett's esophagus was detected in 31.2% of biopsy materials, and with conventional endoscopes in 9.4% of cases.

3. Based on the results of experimental studies on animals (in rats and pigs), it has been proven and confirmed by morphological studies that for the treatment of erosive changes in the mucous membrane of the esophagus using an IR diode laser with an energy of 5 W had a positive effect on experimental rats, while the energy of 7 W in pigs has a positive effect on regeneration and accelerates the healing of the esophageal mucosa. Basically, this effect begins on the 3rd day of the experiment and is clearly manifested on the 7th day of the experiment.

4. The algorithm we developed with the introduction of IR diode laser radiation to complex treatment made it possible to significantly reduce the number of main symptoms (heartburn, belching, epigastric and chest pain, etc.).

And also, according to endoscopic studies after the proposed complex treatment, it was revealed that after 3 sessions of complex treatment there was an improvement in erosive changes at stage I. were identified significantly ($\chi 2= 11.94$, $p= 0.0005$) more in the main group (39.7%) cases than in the comparison group

(14.6%), and patients without esophagitis were also identified significantly ($\chi 2$= 9.58, p= 0.002) more (20.7%) than in the comparison group (3.1%).

PRACTICAL RECOMMENDATIONS

1. All patients with clinical signs of GERD need to be diagnosed and treatment tactics determined. For a complete diagnosis of various erosive and dysplastic changes in the mucous membrane of the esophagus, the endoscopic method with the NBI mode followed by histological examination is a more informative method.

2. All patients with GERD complicated by reflux esophagitis II - IV stage. and pathological conditions of the esophageal mucosa, complex (conservative, laser therapy and surgical) treatment is indicated. For surgical treatment, effective operations are laparoscopic crurorrhaphy with Nissen or Toupet fundoplication. Antireflux surgeries prevent the main cause of GERD – hiatal hernia. Conservative therapy is carried out according to the standard.

3. For patients with various erosive and dysplastic complications of GERD, the use of endoscopic infrared diode laser radiation before and after surgery is recommended to reduce inflammatory processes, improve microcirculation and tissue restoration. IR diode laser radiation can be performed in both outpatient and inpatient settings.

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LIST OF ABBREVIATIONS

NBI – Narrow Band Imaging (narrow band mode)

VEL – High Energy Lasers

HHH - hiatal hernia

GERD – gastroesophageal reflux disease

GSD - cholelithiasis

IR diode laser b – Infrared diode laser b

PPI - proton pump inhibitors

LILI - low-intensity laser radiation

LES - lower esophageal sphincter

EGC – esophagogastric junction

RE - reflux esophagitis

SPV - selective proximal vagotomy

UTS - ultrasound examination

EGDFS – esophagogastroduodenoscopy