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Стаття надійшла 28.11.2021 р.

DOI 10 26724/2079-8334-2022-4-82-20-25 UDC 616-079.8+616.34-007.43-31/616.329

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DIAGNOSIS AND CORRECTION OF COMPLICATIONS OF INSUFFICIENCY OF ANTI-REFLUX FUNCTION OF THE PHYSIOLOGICAL CARDIA IN HIATAL HERNIAS

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To improve the diagnosis and treatment of complications of the insufficiency of the antireflux function of the physiological cardia in hiatal hernias, an examination was performed on 78 patients. All patients underwent X-ray examination with determination of the type of hiatal hernia and endoscopic examination with detection of non-erosive reflux esophagitis – in 9 (11.5 %) patients, erosive reflux esophagitis in 16 (20.8 %), ulcers of the lower third of the esophagus in 3 (3.8 %), peptic stricture of the lower third of the esophagus in 3 (3.8 %), and Barrett's esophagus in 3 (3.8 %) patients. It is proposed to stage the treatment of complications of insufficiency of the antireflux function of the physiological cardia in hiatal hernias with the use of conservative therapy, hydrostatic balloon dilatation or argon plasma coagulation and prepare the patient for the second stage of treatment – antireflux surgery.

Key words: hiatal hernia, gastroesophageal reflux disease, reflux esophagitis, Barrett's esophagus, argon plasma coagulation, hydrostatic balloon dilatation.

О.М. Бабій, Н.В. Пролом, Б.Ф. Шевченко, А.М. Галінська, Н.В. Поляк, О.В. Пахолка ДІАГНОСТИКА ТА КОРЕКЦІЯ УСКЛАДНЕНЬ НЕДОСТАТНОСТІ АНТИРЕФЛЮКСНОЇ ФУНКЦІЇ ФІЗІОЛОГІЧНОЇ КАРДІЇ ПРИ ГРИЖАХ СТРАВОХІДНОГО ОТВОРУ ДІАФРАГМИ

Для покращення діагностики та лікування ускладнень недостатності антирефлюксної функції фізіологічної кардії при грижах стравохідного отвору діафрагми проведено обстеження у 78 хворих. Усім пацієнтам проведено рентгенологічне дослідження зі встановленням типу грижі стравохідного отвору діафрагми та ендоскопічного дослідження з виявленням неерозивного рефлюкс-езофагіту – у 9 (11,5 %) пацієнтів, ерозивного рефлюкс-езофагіту у 16 (20,8 %), виразки нижньої третини стравоходу у 3 (3,8 %), пептичної стриктури нижньої третини стравоходу у 3 (3,8 %) та стравоходу Барретта – у 3 (3,8 %) пацієнтів. Запропоновано етапність лікування ускладнень недостатності антирефлюксної функції фізіологічної кардії при грижах стравохідного отвору діафрагми із застосуванням консервативної терапії, балонної гідродилатації чи аргоноплазмової коагуляції та підготувати хворого до другого етапу лікування – антирефлюксного оперативного втручання.

Ключові слова: грижа стравохідного отвору діафрагми, гастроезофагеальна рефлюксна хвороба, рефлюксезофагіт, стравохід Барретта, аргоноплазмова коагуляція, ендоскопічна балонна гідродилятація.

The work is a fragment of the research project "To study the features of the complicated course of the hiatal hernia, gastroesophageal reflux disease, esophageal achalasia, stenosis of the gastroduodenal zone of ulcer genesis and to improve the methods of their surgical correction with the use of endolaparoscopic technologies", state registration No. 0119U102471.

Cardia is an anatomical and functional formation of the gastroesophageal junction (crura of diaphragm, Laimer-Bertelli connective membrane, Gubarev valve, gastric bubble, angle of His) that provides its pulp-valve function. Insufficiency of the physiological cardia is accompanied by pathological reflux of gastric contents into the esophagus: gastroesophageal reflux disease (GERD), migration of a part of the stomach into the chest cavity – hiatal hernia (HH) [1, 2].

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HH is diagnosed in 2.5-5 % of children, 10-15 % of people under 30, and 50-60 % of patients over 50. In 50 % of patients with HH, there are no clinical manifestations, and they are detected during the examination of the patient [3, 4]. The annual increase in the number of patients with this pathology is determined. GERD, observed in HH, can cause severe disorders such as reflux esophagitis, esophageal ulcer, peptic esophageal stricture, and Barrett's esophagus, ranging from 11 to 50 % [3, 4, 12].

Diagnosis and treatment of complications of HH and GERD are urgent problems in surgical gastroenterology. The diagnosis of complications of HH and GERD is based on the clinical picture and instrumental research methods. Instrumental research methods used to diagnose complications of HH and GERD include X-ray examination, esophagogastroduodenoscopy with esophageal hiatus biopsy, and daily pH measurement of the esophagus and stomach [2, 5, 13].

Conservative anti-reflux therapy for complications of HH and GERD is symptomatic since it does not eliminate the leading cause of HH disease – gastroesophageal junction insufficiency [10, 12, 14].

Considering the combination of HH and GERD with Barrett's esophagus, developing the most optimal treatment options for patients with this pathology is still ongoing. The primary purpose of treatment is to eliminate not only the cause of gastroesophageal reflux but also to eliminate the histological signs of mucous membrane (MM) damage to the esophagus, characteristic of Barrett's esophagus [2, 8, 9].

One of the modern endoscopic methods of treating Barrett's esophagus is using high-energy lasers (argon, semiconductor, copper vapor, YAG-neodymium, etc.). The absence of direct contact of the electrode with MM during laser coagulation indicates a milder post-coagulation course in patients than after electrocoagulation (frequency of complications 9-15 %) [10].

Because the gastroesophageal reflux causes Barrett's esophagus, most surgeons consider it necessary to perform antireflux operations using "classic" laparoscopic methods (a type of fundoplication with crurotomy) [1, 2, 7, 14, 15]. The main tasks of surgical treatment of HH and GERD are correcting anatomical and physiological disorders: hernia removal, correction of the antireflux function of the cardia thanks to fundoplication and crurorrhaphy, and ensuring free antegrade passage of food [3, 6, 11]. In recent years, the use of laparoscopic interventions has become a priority in the surgical treatment of HH worldwide, which significantly reduce surgical trauma, the duration of interventions, and the number of intra- and postoperative complications, and favorably differ in short rehabilitation periods [7, 13].

Therefore, despite the long-term experience of achievements in endolaparoscopic surgery of HH and GERD and the correction of their complications, many debatable issues remain relevant and require a practical solution in terms of phasing in the section on treatment tactics [6].

The purpose of the study was to improve methods of diagnosis and treatment of complications of physiological cardia insufficiency in hiatal hernias and gastroesophageal reflux disease.

Material and methods. In 2017–2021, under the study tasks, the Department of Surgery of the Digestive Organs of the State Institution "Institute of Gastroenterology of NAMS of Ukraine" examined 78 patients with HH (ICD-10 - K 44), complications due to insufficiency of the physiological cardia were found in 34 (43.6 %) of cases. In the studied patients, the diagnosis of HH was confirmed by X-ray examination. X-ray examination of the esophagus, stomach, and duodenum with barium sulfate (ATC code VO8BF02) and a special technique to detect insufficiency of the physiological cardia and HH was performed on the OPERA T90 CEX device. The type and degree of HH were determined during the X-ray examination. The Allison (1951) classification was used to determine the HH type: type I axial, or acquired, HH; type II – paraesophageal, or congenital, HH; type III – a combination of types I and II of HH; type IV - a large defect in the diaphragm with prolapse into it not only the stomach but also other organs of the abdominal cavity. Depending on the amount of penetration of organs from the abdomen into the chest cavity, there are three degrees of HH: degree I - the abdominal part of the esophagus prolapses into the chest cavity, the cardia is at the level of the diaphragm, and the stomach rises and lies close to the diaphragm; degree II - part of the stomach is already located in the area of the esophageal hiatus; degree III — the bottom, the body of the stomach, and sometimes its astral part can prolapse into the chest cavity [4].

An essential stage in the diagnosis of complications of HH and GERD is an endoscopic examination of the MM of esophagus and stomach with an assessment of the gastroesophageal junction, lower esophageal sphincter (LES) and the degree of closure of the cardiac fold, which was performed using the EVIS EXERA III OLYMPUS 190 equipment with the NBI mode, high resolution – HD. A decrease in the distance from the anterior incisors to the cardia is an endoscopic sign of HH, which is revealed by the shortening of the esophagus, the presence of a hernia cavity or another entrance to the stomach. Incomplete closure of the cardia, prolapse of the MM of the stomach into the esophagus, and possible detection of a

stricture in the lower third of the esophagus (as a result of the action of the contents of the stomach on the MM of the esophagus). During the endoscopic examination, MM erosion and ulceration were evaluated as the main criteria for diagnosing reflux esophagitis and determining its severity. The Los Angeles classification was used to assess the degree of esophagitis in patients with HH and GERD. An endoscopic examination of esophageal MM in a narrow spectral range (NBI-endoscopy) was used to diagnose Barrett's oesophagus, and the material was taken for morphological analysis. Cylindrical esophageal metaplasia of MM was determined in the presence of a Z-line raised by more than 1 cm (the line of transition of the squamous epithelium to the cylindrical one). It was localized proximal to the anatomical junction of the esophagus and stomach (top of the gastric folds) with the formation of a certain segment of the esophagus covered with metaplastic cylindrical epithelium (columnar-lined esophagus – CLE), which looks like bright pink pathological areas against the background of pale pink esophageal MM above the gastroesophageal junction ("fingers of flame"). The Prague classification "C and M" was used to describe Barrett's oesophagal segment, where C is the circular length, and M is the maximum length of the prevalence of esophageal cylindrical MM epithelium.

Results of the study and their discussion. At X-ray examination, 60 (77.0 %) patients were found to have axial HH (type I), paraesophageal (type II) – in 9 (11.5 %) patients, and mixed (type III) – in 9 (11.5 %). Depending on the amount of penetration of organs from the abdominal cavity into the thoracic cavity, 1st-degree HH was noted in 42 (53.8 %) patients, 2nd-degree – in 27 (34.6 %) patients, 3rd-degree – in 9 (11.5 %) patients (Fig. 1).



Fig. 1. Hiatal hernia: A-type I, degree I; B-type II, degree II; C- type III, degree III.

In addition to determining the type and degree of HH for further treatment tactics, it is important to establish the fixation of HH (fixed/unfixed). Large hernias (cardiofundal and giant ones) are usually diagnosed as fixed ones.

Endoscopic examination of the examined patients confirmed the presence of HH in all cases. The characteristic endoscopic signs of HH were: a decrease in the distance from the anterior incisors to the cardia – in 9 (11.5 %) cases, the presence of a hernial cavity, a "second entrance" to the stomach – in 9 (11.5 %) cases; gaping or incomplete closure of the cardia – in 42 (53.8 %) cases; prolapse of the mucous membrane of the stomach into the esophagus - in 27 (34.6 %) cases; cardiac folds of the 3rd and 4th degrees were found in 52 (66.7 %) and 9 (11.5 %) cases, respectively. Signs of non-erosive reflux esophagitis were found among the complications caused by the insufficiency of the cardia – MM inflammation (erythema) was detected in 9 (11.5 %) cases, erosive reflux esophagitis – the erosion of the lower third of the esophagus revealed in 16 (20.8 %) patients: grade A esophagitis was diagnosed in 6 (7.7 %) cases, grade B in 10 (12.8 %) (according to the Los Angeles classification). In 3 (3.8 %) patients with HH, esophageal ulcers were detected during the examination, and in 3 (3.8 %) – peptic stricture of the esophagus. Using endoscopy of the esophagus in a narrow spectral range (NBI-endoscopy), 3 (3.8 %) patients were diagnosed with CLE metaplasia with signs of intestinal metaplasia (Barrett's esophagus) without symptoms of reflux esophagitis. When analyzing the nature of CLE, it should be noted that there was a combination of a circular segment from 3 to 6 cm (on average 4 cm) and "finger" segments from 4 to 11 cm (on average 6 cm). In all cases, signs of intestinal metaplasia were found in CLE with MM dysplasia, which was confirmed morphologically (mild dysplasia).

Thus, complications of the insufficiency of the antireflux function of the physiological cardia in HH and GERD, which are manifested by pathological changes in the MM of the esophagus, were found in 34 (43.6 %) cases.

The most common complications of esophageal MM in HH and GERD are shown in Figure 2.



Fig. 2. Endoscopic manifestations of complications of HH and GERD: A - erosive esophagitis grade C; B - esophageal ulcer; C - esophageal stricture; D - Barrett's esophagus.

In 3 (3.8 %) patients with HH and GERD after diagnosis of esophageal ulcer, conservative therapy was performed for 3–4 days and a control endoscopic examination in dynamics before ulcer healing, in which 3 (3.8 %) cases revealed peptic stricture of the esophagus. Endoscopic balloon hydrodilation of the esophagus was performed in these patients (Fig. 3).



Fig. 3. Endoscopic balloon hydrodilation for peptic stricture of the esophagus. Stages of dilatation of the esophageal stricture area under endoscopic control: A- administration of the balloon; B – injection of liquid into the balloon; C – dilatation; D – the view of the esophagus after the dilation session.

After normalising the passage through the esophagus within 3–4 days, the next stage was the performance of antireflux surgery using the laparoscopic method.

To perform balloon hydrodilatation of the esophagus, balloons of the company "Boston Scientific" (USA) with a diameter of 16–18–20 mm were used. In each case, the diameter of the balloon was selected individually, depending on the degree of narrowing and the intensity of the pain syndrome during dilatation. The balloon under visual endoscopic control was placed directly in the narrowing zone; during the session, the pressure in the balloon was raised to 3–5 ATM, with an exposure duration of up to 60 seconds. Each patient underwent 2 to 3 sessions at an interval of one day. After dilation, endoscopic and X-ray control of the dilation area was performed for possible complications, and the effect of the intervention was evaluated.

In 3 (3.8 %) patients diagnosed with Barrett's esophagus on the background of HH and GERD (the diagnosis was confirmed by histological examination), two-stage treatment was performed on the background of conservative therapy. The first step was argon plasma coagulation of the altered esophageal MM (Fig. 4). The duration of endosurgical and conservative treatment was 6 months. The second stage was laparoscopic antireflux surgery.



Fig. 4. Argon-plasma coagulation of MM in Barrett's esophagus: A – endoscopic argon-plasma coagulation in NBI mode; B, C – endoscopic argon plasma coagulation in the usual mode.

The endoscopic argon plasma coagulation technique consisted of the following stages: examination with assessment of the necessary volume of ablation, injection into the submucosal layer of physiological solution to create a protective lifting, ablation of selected areas of CLE. During one session, argon plasma coagulation of MM was performed on 1/3 of the esophagus. The timing of the next coagulation session depended on the results of the control endoscopy and histological signs of esophageal MM healing, which averaged 2 months. The number of sessions of endoscopic argon plasma coagulation depended on the size of cylindrical metaplasia segments and ranged from 2 to 4 times. The first endoscopic control was performed 2 months later. In the absence of inflammatory processes in the esophageal MM, endoscopic argon plasma coagulation sessions were performed against the constant administration of proton pump inhibitors. 2 months after the last session of endoscopic argon plasma coagulation in cases of complete elimination of CLE foci, patients were referred for planned surgical treatment with antireflux surgical interventions.

Conservative treatment was carried out in all patients with complications of HH and GERD. To solve the problems listed above, several conservative measures were used to reduce the symptom complex identified in the patient, including a list of recommendations for changing lifestyle and nutrition, pharmacotherapy (proton pump inhibitors, alginates, prokinetics), physiotherapeutic procedures and physical therapy.

After the elimination of complications of HH and GERD, all 34 (43.6 %) patients immediately underwent stage II of treatment – laparoscopic antireflux surgery. Fundoplication was performed in different ways: according to Nissen – in 12 (48.0 %) cases; according to Toupet – in 2 (8.0 %) cases. And in 11 (44.0 %) cases – according to the proposed method ("Surgical correction of failure of the physiological cardia with hiatal hernias" published in the journal Gastroenterology: a collection of scientific articles. 2021. Volume 55. No. 1.)

Thus, the first stage of treatment was carried out in 34 (43.6 %) patients with complications caused by insufficiency of the physiological cardia of the HH and GERD. It consisted of the elimination of complications from the MM of the esophagus. Namely, erosive reflux esophagitis, esophageal ulcer, peptic stricture of the esophagus, and Barrett's esophagus using conservative therapy, balloon hydrodilatation, and argon plasma coagulation. Treatment of complications of anti-reflux insufficiency should be performed before performing anti-reflux surgery. The conditions for establishing the success of the treatment of complications of antireflux insufficiency were the early implementation of stage II of treatment, namely, antireflux surgery.

Insufficiency of the antireflux function of physiological cardia in HH and GERD can cause the appearance of such complications as esophageal ulcer, peptic stricture of the esophagus, and Barrett's

esophagus. For example, 2–7 % of patients with HH and GERD have an esophageal ulcer, 4–20 % have a peptic stricture of the esophagus, and 7 % of patients have Barrett's esophagus, which is an obligatory precancer and increases the annual risk of developing esophageal adenocarcinoma by 0.12 times. [1, 6].

Conservative therapy does not eliminate the cause, namely, HH, which is the cause of the insufficiency of the antireflux barrier of the physiological cardia. Namely, the reflux of gastric contents into the esophagus, which accompanies HH and GERD. Surgical anti-reflux intervention is the only radical way to restore its function and eliminate gastroesophageal reflux [9, 11, 13, 15]. The choice of treatment method for complications of HH and GERD with reflux esophagitis is determined by the type and size of the hernia, the severity of the clinical picture and the degree of damage to the esophageal MM. The main task of treatment is to eliminate the cause of reflux, namely, HH and/or LES insufficiency, which in turn helps prevent the development of complications: erosive lesions of the esophageal MM, ulcers of the esophageal MM, Barrett's esophagus, and esophageal strictures [6].

Identified complications of HH and GERD, such as esophageal ulcer or Barrett's esophagus, require two-step treatment [9]. Prospective continuation of the study for dynamic monitoring of patients, analysis of long-term results and effectiveness of treatment after 3–5 years.

1. The use of endoscopy with biopsy and morphological examination allows us to detect in 34 (43.6 %) patients complications of insufficiency of the antireflux function of the physiological cardia in HH and GERD, namely: non-erosive reflux esophagitis in 9 (11.5 %) cases, erosive reflux esophagitis in 16 (20.8 %), ulcer of the lower third of the esophagus in 3 (3.8 %), peptic stricture of the lower third of the esophagus in 3 (3.8 %) cases.

2. Treatment of complications of insufficiency of the antireflux function of the physiological cardia in HH and GERD with the use of conservative therapy, endoscopic balloon hydrodilatation and argon plasma coagulation allows to eliminate its consequences and prepare the patient for the second stage of treatment, namely, antireflux surgery.

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Стаття надійшла 30.11.2021 р.