UDC 616-079.8+616.34-007.43-31/616.329

Diagnosis and surgical treatment of hiatal hernias

Prolom N.V., Shevchenko B.F., Zeleniuk O.V.

SI "Institute of Gastroenterology of the National Academy of Medical Sciences of Ukraine", Dnipro, Ukraine

Abstract.

The aim of the study: to improve the effectiveness of diagnosis and surgical treatment of patients with hiatal hernia.

Materials and methods of research. Were examined 56 patients with hiatal hernias (HH), who were treated in the Department of the Digestive Surgery of the State Institution "Institute of Gastroenterology of the National Academy of Medical Sciences of Ukraine" in 2020-2021, of which sliding (axial) HH was detected in 42 (75.0 %) - type I; paraesophageal hernias- in 6 (10.7 %) – type II; mixed HH (combination of types I and II) in 8 (14.3 %) – type III. The diagnosis was established by esophagogastroduodenoscopy (with NBI mode, high resolution), X-ray examination, manometry.

Research results and their discussion. After confirmation of the diagnosis of HH, surgical treatment (antireflux surgery) was performed in 56 (100 %) patients. The choice of method of antireflux reconstruction was determined by the severity of reflux and the nature of the contractile activity of the esophagus. The reconstruction by Nissen with full fundal mobilization and a dissection of gastro-splenic and esophageal-diaphragmatic ligaments - Floppy-Nissen was carried out in case of revealed esophageal normokinesia and the expressed reflux. In patients with minimal manifestations of reflux or esophageal motility disorders with anatomical features, reduction of the size of the fundus and stomach - partial circular or anterior fundoplications were performed. Thus, crurorraphy was performed in 100.0%. Laparoscopic fundoplications were performed by Nissen modification in 36 (64.3%) patients, by Toupet modification in 6 (10.7%) patients and by Dor modification in 3 (5.4%) patients. 11 (19.6%) patients underwent surgery according to a new technique that provides reliable restoration of physiological cardia and preservation of the anatomical relationship between the diaphragm and the area of the esophageal-gastric junction and includes crurorraphy and fundoplication.

Conclusions. The proposed method of surgical treatment of physiological cardia insufficiency in HH is less traumatic than known. The application of the proposed method provides reliable restoration of physiological cardia and preservation of the anatomical relationship of the diaphragm and the area of the esophageal-gastric junction, reduces the risk of bleeding and hyperfunction of the cardia. In the postoperative period, this method of surgical treatment reduces the likelihood of recurrence of physiological cardia insufficiency, dysphagia and recurrence of the disease.

Key words: hiatal hernia, laparoscopic fundoplication, crurorraphy.

Introduction. Hiatal hernias occupies one of the first places in prevalence in modern gastroenterology [1, 2]. Timely diagnosis and treatment of HH and reflux esophagitis, which often accompanies hernia, is one of the most pressing problems of the last decade in surgical gastroenterology. There is an annual increase in the

number of patients with this nosology, and the proportion of complicated forms is growing accordingly. The most severe complications include ulcer, peptic stricture and intestinal metaplasia of Barrett, which ranges from 11 to 50% [3].

In Ukraine, the frequency of GERD has been insufficiently studied, multicenter studies have not been conducted, and, according to some authors, the incidence of GERD is 37.7-38.9 %. Progression of the disease in 2-7 % of patients leads to esophageal ulcer, in 4-20 % - to peptic stricture of the esophagus, in 7% of patients - to the development of Barrett's esophagus, which is an obligate precancer and increases the annual risk of esophageal adenocarcinoma by 0.12 times [4, 5].

A number of factors play an important role in the occurrence of reflux from the stomach into the esophagus: failure of the lower esophageal sphincter; temporary episodes of lower esophageal sphincter relaxation; insufficiency of esophageal clearance; pathological changes in the stomach, increasing the severity of physiological reflux. In more than 85% of cases, episodes of decreased intraesophageal acidity lower than 4 are not accompanied by any feelings [6].

Conservative antireflux therapy is symptomatic because it does not eliminate the main causes of the disease -HH and physiological cardia insufficiency. The only radical way to restore the function of the cardiac sphincter and eliminate gastroesophageal reflux is surgery. Mini-invasive interventions have changed the ratio of operations for HH, as well as significantly expanded the indications for surgical treatment. The main task of surgical treatment is the correction of anatomical and physiological disorders: elimination of diaphragmatic hernia, correction of antireflux function of the lower esophageal sphincter due to fundoplication and crurorraphy, ensuring free antegrade passage of food [7, 8, 9]. The purpose of these operations is to create optimal conditions for the restoration of the antireflux mechanism of the esophagocardial zone. Despite many years of experience in laparoscopic interventions in HH surgery, many issues are under discussion, remain relevant and require practical solutions [10].

The aim of the study. To improve the effectiveness of diagnosis and surgical treatment of patients with hiatal hernia.

Research results and their discussion. Were examined 56 patients with hiatal hernias (HH), who were treated in the Department of the Digestive Surgery of the State Institution "Institute of Gastroenterology of the National Academy of Medical Sciences of Ukraine" in 2020-2021, of which sliding (axial) HH was detected in 42 (75.0 %) - type I; paraesophageal hernias - in 6 (10.7 %) (type II); mixed HH (combination of types I and II)- in 8 (14.3 %) (type III) (ICD-10 code - K 44.). Among the examined patients with HH, ie with lower esophageal sphincter insufficiency, there were 13 men (23.2 %) and 43 women (76.8 %). The age of patients ranged from 25 to 68 years. The mean age of patients was (53.50 ± 3.89) years. To identify changes in general clinical indicators of blood in all patients used a unified method of determining the general analysis of blood, liver and kidney complex, coagulogram, indicators of carbohydrate metabolism.

To visually assess the condition of the mucous of the esophagus, stomach, duodenum in pathology of the esophagogastroduodenal area were performed endoscopic studies in the department of minimally invasive endoscopic interventions

and instrumental diagnostics of the Institute using EVIS EXERA III OLYMPUS 190 (with HD NBI mode) and videogastroscope PENTAX EG-290 Kp (Japan) with biopsy and histological examination.

To establish and confirm the diagnosis, patients underwent X-ray examination of the esophagus, stomach, duodenum. The X-ray examination consisted of review radiography, and radiography of the esophagus, stomach, duodenum using barium sulfate (ATC code VO8BF02), on the device OPERAT90SEX. Special techniques and techniques were used to detect insufficiency of the esophageal-gastric junction. Polypositional radiography was performed in the vertical, horizontal position of the patient, in the position of Trendelenburg, at the time of lifting the device, with forced breathing.

To register the motional and kinetic function of the esophagogastroduodenal zone (measurement of sphincter tone), balloon manometry under endoscopic control was used. The research is performed by an original device for studying the motility of the gastrointestinal tract MNH-01 (protected by copyright certificate №923521 "The device for studying the motility of a biological object", and manufactured by the company "Ukrainian Medical Systems".

Results of the research. Analyzing the complaints of the examined patients, it can be noted that the most frequent clinical manifestations in patients with HH and GERD were epigastric pain (83.6 %), heartburn (83.6 %) and belching (76.4 %). In 76.4 % of cases, there was a clinical combination of epigastric pain, heartburn and belching, which was characteristic (according to EGDS and X-ray passage) for sliding HH and GERD with esophagitis. In 18.2% of the examined patients, the most frequent clinical manifestations were a combination of chest pain when swallowing with dysphagia and regurgitation, which was characteristic (according to EGDS and X-ray passage) for paraesophageal HH.

At X-ray examination, the direct symptoms of HH were: absence of stomach gas bladder, prolapse of the gastric mucosa in the distal part of the esophagus, straightening of the angle of His, antiperistaltic movements of the esophagus, movement of the stomach into the thoracic cavity.

Depending on the amount of migration of organs from the abdomen into the thoracic cavity, HH of 1 degree was observed in 24 (42.8 %) patients, HH of 2 degree, when in the esophageal orifice of the diaphragm came out cardia and part of the bottom of the stomach was noted in 27 (48.2 %) patients. The fundus, body or the whole stomach migration into the thoracic cavity qualifies as HH of 3 degree and was noted in 11 (9.0 %) patients.

The EGD was performed in 56 patients with HH. No changes in the shape and diameter of the esophagus were detected in all patients. An increase in the distance between EGJ and hiatus of more than 2 cm was detected in 40 (71.4 %) patients. Prolapse of the gastric mucosa into the esophagus was determined in 22 (39.3 %) cases, the presence of the second entrance to the stomach in 6 (10.7%), cardiac fold of III-IV degree in 51 (91.1 %). Erosions of the lower third of the esophagus were found in 10 (17.8 %) patients, in 5 (8.9 %) patients had esophagitis grade A, and 7 (12.5 %) patients - grade B (according to the Los Angeles classification). The endoscopic data in 54 (96.4 %) patients did not show an increase in gastric size. The

gastric mucosa had a normal appearance in 38 (67.9 %) cases. Signs of gastric inflammation were found in 10 (17.8 %) patients, erosions in the antrum of the stomach in 9 (16.0 %) patients. The pylorus had a normal appearance in 46 (82.1 %) patients. Pyloric spasm was detected in 5 (8.9 %) patients.

Thus, endoscopic examination in patients with HH revealed the following most common changes: erosion of the lower third of the esophagus (17.8%); increased distance between EGJ and hiatus more than 2 cm in 40 (71.4%) patients; cardial fold of III-IV degree in 51 (91.1%) patients; inflammation and erosions in the body and cardial part of the stomach in 19 (33.8%) and prolapse of the gastric mucosa into the esophagus in 22 (39.3%) patients. These changes may be the main endoscopic markers for the diagnosis of HH or GERD.

According to the results of the study, it was found that in patients with HH, the average of increase in pressure in the cylinder during the passage of the lower esophageal sphincter zone was (12.99 ± 3.25) mm Hg In patients with type I (sliding or axial) of HH, the pressure during the passage of the lower esophageal sphincter zone was (15.38 ± 4.56) mm Hg. In patients with type II (paraesophageal) of HH, the pressure in the balloon during the passage of the lower esophageal sphincter was (11.55 ± 5.08) mm Hg. In patients with type III (mixed) of HH there was no resistance to the passage of the balloon in the area of the inlet of the stomach was detected. In patients with GERD, the value of pressure in the area of the lower esophageal sphincter was (9.81 ± 3.18) mm Hg. It was found that among patients with type III (mixed) of HH there was no pressure on the balloon during the passage of the lower esophageal sphincter.

Thus, according to the results of the study, the highest pressure was observed in patients with axial HH (15.38 ± 4.56) mm Hg, and the lowest - in patients with GERD (9.81 ± 3.18) mm Hg.

After confirmation of the diagnosis of HH, surgical treatment (antireflux surgery) was performed in 56 (100%) patients. The choice of method of antireflux reconstruction was determined by the severity of reflux and the nature of the contractile activity of the esophagus. The reconstruction by Nissen with full fundal mobilization and a dissection of gastro-splenic and esophageal-diaphragmatic ligaments - Floppy-Nissen was carried out in case of revealed esophageal normokinesia and the expressed reflux. In patients with minimal manifestations of reflux or esophageal motility disorders with anatomical features, reduction of the size of the fundus and stomach - partial circular or anterior fundoplications were performed. Thus, crurorraphy was performed in 100.0%. Laparoscopic fundoplications were performed by Nissen modification in 36 (64.3%) patients, by Toupet modification in 6 (10.7%) patients and by Dor modification in 3 (5.4%) patients. Fundodiaphragmopexy was performed in 43 (76.8%).

In order to improve the results of treatment in patients with HH and GERD, a new method of surgical correction of physiological cardia failure has been proposed. Thus, in 11 (19.6 %) patients a new technique was used, which provides reliable restoration of physiological cardia and preservation of the anatomical relationship of the diaphragm and the esophageal-gastric junction and includes crurorraphy and fundoplication. Crurorraphy is performed with U-shaped sutures, which are applied

to the right and left walls of the esophagus at the level of the cardia with fixation of the diaphragm crura, corrugated sutures, which are applied to the medial crura of the diaphragm, reduce the esophageal orifice to the outer diameter of the esophagus and perpendicular sutures perform cardiogastroplication of the anterior wall of the stomach, followed by gastrodiaphragmopexy.

The effectiveness of treatment in patients was evaluated by the following criteria: clinical disappearance of heartburn, belching, regurgitation, epigastric pain; no erosions in the lower third of the esophagus, no prolapse of the gastric mucosa into the esophagus according to EGD; no prolapse of the stomach into the thoracic cavity, no sphincter insufficiency, no prolapse of gastric mucosa according to X-ray examination; normalization of pressure in the lower esophageal sphincter according to manometry.

During the study of long-term results in patients, in 5 cases (8.9 %) in the long term of the study (up to 6 months) relapses of HH were diagnosed. The postoperative condition of patients operated on by the proposed method was satisfactory, without signs of postoperative dysphagic disorders. In all cases, good direct and long-term results were obtained for up to 1 year.

Conclusion. The proposed method of surgical treatment of physiological cardia insufficiency in HH is less traumatic than known. The application of the proposed method provides reliable restoration of physiological cardia and preservation of the anatomical relationship of the diaphragm and the area of the esophageal-gastric junction, reduces the risk of bleeding and hyperfunction of the cardia. In the postoperative period, this method of surgical treatment reduces the likelihood of recurrence of physiological cardia insufficiency, dysphagia and recurrence of the disease.

The work is part of scientific research work №1 "To study the features of the complicated course of hiatal hernia, gastroesophageal reflux disease, achalasia of the cardia, stenosis of the gastroduodenal area of ulcerative origin and to improve methods of their surgical correction using endolaparoscopic technologies (№ of state registration 0119U102471).

Authors' contributions: the author took part in the development of ideas and research, supervision of patients, processing of results.

Reference

1. B.O. Matviychuk, AA Guraevsky, AR Stasyshyn. Experience of laparoscopic operations in patients with hernia of the esophageal orifice of the diaphragm and gastroesophageal reflux disease. Clinical surgery. 2018; 85 (12):23–25.

2. Stasishin A.R. Diaphragmatic grids in clinical surgical practice. Galitskiy lykarskiy visnik. 2016; 3, No. 3 (23):57-58.

3. Tsygankova O.V., Latyntseva L.D., Batluk T.I. et al. Gastroesophageal reflux disease with extraesophageal manifestations, the formation of Barrett's esophagus against the background of hernia of the esophageal opening of the diaphragm. Exp. and clinical gastroenterology. 2019; 163 (3):16-23. DOI: 10.31146 / 1682-8658-ecg-163-3-16-23

4. MM Veligodsky, OV Gorbulich, VV Komarchuk. Prevention of adverse results of laparoscopic correction of antireflux function of the cardia in hernias of the esophageal orifice of the diaphragm and achalasia of the esophagus. Odessa Medical Journal. 2016; 3 (149): 66-69.

5. Puchkov K.V., Khabarova E.V., Tishchenko E.S., Golubev S.S. Results of the use of radiofrequency ablation in the treatment of Barrett's esophagus. Moscow surgical journal. 2019; 3 (67):10-19.

6. Malinovsky AV, Grubnik VV. Comparison of laparoscopic crurography and plastics with the use of a lightweight mesh graft for large hernias of the esophageal orifice of the diaphragm Hirurgiya of Ukraine. 2016; 9:14-18.

7. Renzi, A., Di Sarno, G., d'Aniello, F., Brillantino, A., Minieri, G., Coretti, G., Barbato, D., & Barone, G. (2020). Complete fundus mobilization reduces dysphagia after Nissen procedure. *Surgical Innovation*. https://doi.org/10.1177/1553350620971174

8. K. Nurczyk, M. D. Corpo, M.G. Patti. Hiatal hernia . Benign Esophageal Disease: Modern Surgical approaches and Techniques. Springer. 2021; Vol. 3:59-71. Availible at: https://doi.org/10.1007/978-3-030-51489-1.

9. Rawlings, A., Soper, N. J., Oelschlager, B., Swanstrom, L., Matthews, B. D., Pellegrini, C., Pierce, R. A., Pryor, A., Martin, V., Frisella, M. M., Cassera, M., & Brunt, L. M. (2012). Laparoscopic Dor versus Toupet fundoplication following Heller myotomy for achalasia: results of a multicenter, prospective, randomized-controlled trial. Surgical endoscopy, 26(1), 18–26. https://doi.org/10.1007/s00464-011-1822-y.

10. Morales-Conde, S., Lopez Bernal, F., & Alarcón I. (2021). Minimally Invasive Surgery of Paraesophageal Hernias. In Asunción Acosta, M., Cuesta, M. A., & Bruna, M. *Atlas of Minimally Invasive Techniques in Upper Gastrointestinal Surgery* (pp. 39-47). Springer, Cham. https://doi.org/10.1007/978-3-030-55176-6_6.

Prolom Nataliya V. Degree: PhD of medical sciences, Senior research, SI "Institute of gastroenterology of NAMS of Ukraine", Head The Department of miniinvasive endoscopic interventions and instrumental diagnostics. Senior research of the Department of Surgery of digestive organs, address: Vorontsova av., 8/144, Dnipro, Ukraine, 49023, Tel.: Mob. 067 284 11 07, E-mail:prolom1978y@gmail.com, https://orcid.org/0000-0001-8134-8735.

Shevchenko Boris F. - MD, Doctor of Sci (Med), Professor (Department of Digestive Surgery of the Institute of Gastroenterology of the National Academy of Medical Sciences of Ukraine), Tel.mob. 050 362 95 95, E-mail: shebef1945@gmail.com, https://orcid.org/0000-0001-9253-4883

Zeleniuk Oleksandr V.- Head of the Department of Digestive Surgery of the Institute of Gastroenterology of the National Academy of Medical Sciences of Ukraine, Tel.mob. +380667040674, Email: zeleniuk.a.v@gmail.com, https://orcid.org/0000-0002-3703-7064