

GENERAL PROBLEMS OF SURGERY

Klinichna khirurgiia. 2021 January/February; 88(1-2):3-7.
DOI: 10.26779/2522-1396.2021.1-2.03

Peculiarities of surgical treatment of patients with gastroesophageal reflux disease

B. O. Matviychuk, A. R. Stasyshyn, A. A. Hurayevskyy

Danylo Halytskyi Lviv National Medical University

Особливості хірургічного лікування пацієнтів із гастроєзофагеальною рефлюксною хворобою

Б. О. Матвійчук, А. Р. Стасишин, А. А. Гураєвський

Львівський національний медичний університет імені Данила Галицького

Abstract

Objective. To analyze the effectiveness of various methods of laparoscopic antireflux operations in patients with gastroesophageal reflux disease.

Materials and methods. The results of treatment of 177 patients with gastroesophageal reflux disease from 2015 to 2021 were analyzed. Patients were divided into three groups: 1st – 62 patients who underwent laparoscopic antireflux surgery of our own modification (Patent of Ukraine No 59772); 2nd – 91 patients who underwent laparoscopic Nissen fundoplication; 3rd – 24 patients who underwent laparoscopic Toupet fundoplication.

Results. 36 months after surgery in the 1st group the recurrence rate of gastroesophageal disease was 1.6%, recurrence of hernia of the esophageal orifice – 1.6%, in the 2nd group – 7.7 and 3.3%, respectively; in the 3rd group – 12.5 and 8.3%, respectively.

Conclusions. The application of a new integrated approach to the surgical treatment of gastroesophageal reflux disease reduces the number of postoperative complications (gas –bloat syndrome – 3 times, dysphagia – 5 times), the recurrence rate of gastroesophageal reflux disease – 5 times and recurrence of esophageal hernia – 2 times, improves the quality of life of patients 36 months after surgery in 2.6 times and increases the timeliness of diagnosis and facilitates the choice of differentiated treatment tactics.

Keywords: gastroesophageal reflux disease; surgical treatment; long-term results.

Реферат

Мета. Проаналізувати ефективність застосування різних способів лапароскопічних антирефлюксних операцій у хворих із гастроєзофагеальною рефлюксною хворобою.

Матеріали і методи. Проведено аналіз результатів лікування 177 пацієнтів із гастроєзофагеальною рефлюксною хворобою з 2015 по 2021 р. Пацієнти розподілені на три групи: 1-ша – 62 пацієнти, яким виконана лапароскопічна антирефлюксна операція власної модифікації (Пат. України № 59772); 2-га – 91 пацієнт, якому виконана лапароскопічна фундоплікація за Ніссеном; 3-тя – 24 пацієнти, яким виконана лапароскопічна фундоплікація за Тупет.

Результати. Через 36 міс після операції у 1-й групі частота рецидивів гастроєзофагеальної хвороби становила 1,6%, рецидивів грижі стравохідного отвору діафрагми – 1,6%, у 2-й групі – відповідно 7,7 і 3,3%; у 3-й групі – відповідно 12,5 і 8,3%.

Висновки. Застосування нового комплексного підходу до хірургічного лікування гастроєзофагеальної рефлюксної хвороби зменшує кількість післяопераційних ускладнень («gas–bloat» синдрому – у 3 рази, дисфагії – у 5 разів), частоту рецидивів гастроєзофагеальної рефлюксної хвороби у 5 разів і рецидивів грижі стравохідного отвору діафрагми у 2 рази, покращує якість життя пацієнтів у 2,6 разу через 36 міс після операції і підвищує своєчасність діагностики та полегшує вибір диференційованої лікувальної тактики.

Ключові слова: гастроєзофагеальна рефлюксна хвороба; хірургічне лікування; віддалені результати.

Gastroesophageal reflux disease (GERD) is a condition that occurs with reflux of gastric contents and causes certain "disturbing" symptoms and/or complications. Symptoms are considered "disturbing" if they adversely affect a person's well-being [4]. The causes of GERD include: decrease in the function of the antireflux barrier (primary decrease of pressure in the lower esophageal sphincter, increase in the number of episodes of its relaxation, complete or par-

tial destructuring due to hiatal hernia (HH), short esophagus); decrease in esophageal clearance (chemical – due to reduction of the neutralizing effect of bicarbonate of saliva and esophageal mucus, volumetric – due to suppression of peristalsis and decrease in the tone of the thoracic esophageal wall, damaging effect of refluxate, the inability of the esophageal mucous membrane to counteract the damaging agent, violation of gastric emptying due to pylorospasm or

ulcerative stenosis of the stomach, increased intra-abdominal pressure due to pregnancy or overweight, direct damaging effect of drugs against the esophageal mucosa, decreased pressure in the lower esophageal sphincter due to side effects of drugs [3, 5, 10].

Protective barrier of the esophageal mucous membrane have pre-epithelial, epithelial and post-epithelial levels. The pre-epithelial level includes the water layer, the mucus layer and the presence of an increased concentration of bicarbonate ions. The epithelial level includes the structural and functional features of cellular structures: membranes, intercellular connections, intracellular and intercellular transport, which creates the optimal pH (7.3-7.4), as well as the peculiarities of epithelial cell reproduction. The post-epithelial level of protection is determined by an adequate blood supply and maintenance of the tissue pH. Since the aggressive factor acts mainly in the esophageal lumen, the main protection of the mucous membrane is the mechanism of pre-epithelial protection. Normally, this protective component is enhanced by the quantity and quality of the organic components of saliva (mucin, mucin-free protein, epidermal growth factor and salivary prostaglandin E2). In patients with reflux esophagitis, a significant slowdown in the secretion of mucin and mucin-free protein in response to intraesophageal mechanical and chemical irritation was found [8, 9, 10].

Surgical treatment of GERD should be aimed at restoring the anatomical structures of the antireflux barrier and prevention of recurrence. Antireflux operations are indicated for complicated GERD (recurrent bleeding, peptic strictures of the esophagus, Barrett's esophagus), as well as in case of ineffectiveness of drug therapy, especially in young patients who require maintenance therapy in high doses. Indication for surgery - GERD, combined with a hiatal hernia [2, 7].

A large number of publications are devoted to the problem of surgical treatment of GERD [1, 2, 4, 6], but postoperative complications remain quite high: failure of the esophageal-gastric junction is 55-60% of the total number of complications, and mortality from esophageal-gastric bleeding is 5-15%. GERD is often combined with large and giant HH (50-90%) and poses a high risk of complications such as gastroesophageal ulcers and bleeding, metaplasia and adenocarcinoma of the esophagus, strictures, perforations, compression of the mediastinal organs. The level of satisfaction from surgical treatment in patients with GERD is 62-97%, and in the long run (after 5 years) this figure is 80-96%. Quality of life significantly improves after antireflux laparoscopic surgery based on the results of both short- and long-term studies, including general and specific follow-ups. Specific intraoperative complications include perforation of the stomach and esophagus, pneumothorax, vagal injury. The highest incidence of perforation (1-4%) is observed in re-fundoplication. The authors who studied the methods of antireflux laparoscopic surgery, in particular thoracoscopic ones, report higher levels of perforation of the stomach and esophagus (6.7-9.1%). Purulent-septic complications include

wound infections (ranging within 0.2-3.1%) and postoperative hernias (ranging within 5-9%). High incidence (within 2-25%) of esophageal complications (prolonged dysphagia, strictures, esophageal erosion) after some types of alloplasty requires careful study of the choice of hiatal plastic's type and methods of its performance [4, 6].

During recent years, the types of laparoscopic surgery for GERD have undergone significant modifications, but the number of complications remains high. Among them the most important is the GERD recurrence, HH, sliding of the fundoplication cuff, dysphagia, gas-bloat syndrome. The wrong choice of operation's type, the occurrence of postoperative complications and, as a consequence, the deterioration of quality of life make this pathology one of the relevant problems in modern surgery [1]. The main unsolved problems, which affect the occurrence of complications are: indications for surgical treatment of patients with GERD, combined with HH, preoperative preparation and diagnostic methods, determining the prognosis of recurrence (determining the size of hernia, obesity, increased intra-abdominal pressure), technical aspects of surgery (choice of access, excision of the hernia sac, type of hernioplasty and fundoplication), prevention of intra- and postoperative complications.

Thus, despite the reasonable expediency of the minimally invasive methods application for the diagnosis and treatment of GERD, the issues of reducing the number of recurrences, complications after surgery and improving the quality of life in these patients remain open.

The purpose of our work is to analyze the effectiveness of various methods of laparoscopic antireflux surgery in patients with gastroesophageal reflux disease.

Materials and methods

The therapeutic results among 177 patients with GERD, who were admitted during 2015-2021 to the clinic of surgery and endoscopy of the Faculty of postgraduate education of the Danylo Halytsky Lviv National Medical University, were analyzed. They were divided into 3 groups: Group I - laparoscopic antireflux surgery using our own modification (patent of Ukraine № 59772), included 62 patients; Group II (91 patients) - laparoscopic Nissen fundoplication; Group III (24 patients) - laparoscopic Toupet fundoplication.

The mean age of patients was 51.8 ± 12.1 (19-74) years. There were 89 men (50.3%) and 88 women (49.7%). The mean body mass index (BMI) was 27.8 ± 4.5 (18.5-39.8) kg/m².

The distribution according to the grade of reflux esophagitis (LA classification) was as follows: grade A - 53 patients (29.9%), grade B - 82 patients (46.3%), grade C - 40 patients (22.6%), grade D - 2 patients (1.1%).

The average hiatal area (HA) was 6.5 ± 1.8 (3.9-10.1) cm². The average period of long-term results' evaluation was 27.1 ± 11.7 (12-36) months.

Computer program Statistica 10.0 (StatSoft) was used to perform the statistical data analysis. The latter was based on

three types of the research: 1) descriptive statistics, 2) testing of the distribution normality, 3) testing for the statistical significance of differences. The level of significance for statistical tests was chosen as 5%, i.e. the null hypothesis was rejected, if $p < 0,05$.

Results

In group I – the average score of the visual analog scale (VAS) for reflux symptoms was 0.6 ± 0.2 (0-6) points, for dysphagia – 0.2 ± 0.1 (0-6) points, for extraesophageal symptoms – 0.2 ± 0.1 (0-1) points. The average quality of life score, according to the GERD-HRQL questionnaire, was 1.1 ± 0.4 (0-10) points. The distribution by satisfaction's level was as follows: completely satisfied – 59 patients (95.2%), partially satisfied – 1 patient (1.6%), dissatisfied – 2 patients (3.2%). The distribution by grade of reflux esophagitis according to LA classification was as follows: 0 degree was observed in 60 patients (96.8%), grade A – in 2 (3.2%), grade B, C and D – in 0 (0%). The average DeMeester score was 7.0 ± 2.8 (1.1-45.2). The average radiological oesophageal transit time (ROTT) was 3.3 ± 0.9 (3-7) s. The hemoglobin level was 124.6 ± 7.2 (110-149.8). The mean BMI was 29.6 ± 4.5 (20-39.8).

In group II - the average VAS score for reflux symptoms was 2.1 ± 0.8 (0-6) points, for dysphagia – 1.2 ± 0.4 (0-6) points, for extraesophageal symptoms – 0.5 ± 0.2 (0-4) points. The average quality of life score according to the GERD-HRQL questionnaire was 2.9 ± 1.1 (0-9) points. The distribution by satisfaction was as follows: satisfied – 71 patients (78.0%), partially satisfied – 15 patients (16.5%), dissatisfied – 5 patients (5.5%). The distribution according to the grade of reflux esophagitis (LA classification) was as follows: grade 0 was observed in 72 patients (79.1%), grade A – in 15 (16.5%), grade B – in 4 (4.4%). The average DeMeester score was 15.3 ± 1.8 (1.7-67.9). The average ROTT was 5.8 ± 1.9 (3-7) s. The average hemoglobin level was 119.4 ± 2.7 (108.7-137.3). The mean BMI was 28.5 ± 2.1 (20.9-37.7).

In group III - the average VAS score for reflux symptoms was 2.8 ± 1.1 (0-6) points, for dysphagia – 1.9 ± 0.4 (0-6), and for extraesophageal symptoms – 0.8 ± 0.2 (0-5). The average quality of life score according to the GERD-HRQL questionnaire was 4.0 ± 1.6 (0-10) points. The distribution by satisfaction was as follows: satisfied – 17 (70.8%) patients, partially satisfied – 4 (16.7%), dissatisfied – 3 (12.5%). The distribution according to the grade of reflux esophagitis

Table 1. Comparison of results in patients of the 1st and 2nd groups by the number of relapses

Indicator	Groups of patients				p
	1st (n = 62)		2nd (n = 91)		
	n	%	n	%	
GERD	1	1,6	7	7,7	0,0123
Symptomatic recurrence of HH	1	1,6	3	3,3	0,0599
Asymptomatic recurrence of HH	-	-	5	5,5	0,0993
HH	2	3,2	6	6,6	0,1440
Symptomatic recurrence of GERD	1	1,6	3	3,3	0,0599
Asymptomatic recurrence of GERD	1	1,6	4	4,4	0,2158
GERD + HH	1	1,6	6	6,6	0,0678
Symptomatic recurrence of HH + symptomatic recurrence of GERD	1	1,6	3	3,3	0,0599
Asymptomatic recurrence of HH + asymptomatic recurrence of GERD	-	-	4	4,4	0,0784
Strictures	-	-	-	-	-
Repeated operations	-	-	-	-	-

Table 2. Comparison of results in patients of the 1st and 3rd groups by the number of relapses

Indicator	Groups of patients				p
	1st (n = 62)		3rd (n = 24)		
	n	%	n	%	
GERD	1	1,6	3	12,5	0,0534
Symptomatic recurrence of HH	1	1,6	1	4,2	0,1585
Asymptomatic recurrence of HH	-	-	2	8,3	0,0665
HH	2	3,2	2	8,3	0,0806
Symptomatic recurrence of GERD	1	1,6	1	4,2	0,0535
Asymptomatic recurrence oGERD	1	1,6	1	4,2	0,1585
GERD + HH	1	1,6	1	4,2	0,1585
Symptomatic recurrence of HH + symptomatic recurrence of GERD	1	1,6	-	-	0,0521
Asymptomatic recurrence of HH + asymptomatic recurrence of GERD	-	-	1	4,2	0,1625
Strictures	-	-	-	-	-
Repeated operations	-	-	-	-	-

(LA classification) was as follows: 0 degree was observed in 16 (66.7%) patients, grade A – in 4 (16.7%), grade B – in 4 (16.7%). The mean DeMeester score was 23.0 ± 2.4 (3.4-92.1). The average ROTT was 5.8 ± 2.3 (3-7) s. The average hemoglobin level was 112.3 ± 6.3 (128.3-149.1). The mean BMI was 25.7 ± 2.5 (22.7-39.1). Data from the comparative analysis of results in patients of different groups by the number of relapses are given in *Table 1, 2*.

Discussion

Gastroesophageal reflux disease is currently one of the most common diseases of the gastrointestinal tract. GERD is recognized as a disease of the XXI century, which affects from 20 up to 50% of the population around the world. GERD and HH remain the leading causes of reduced quality of life, and the development of a number of complications. The relevance of the problem increases in case of complicated GERD and the development of extraesophageal manifestations of the disease, which complicates the diagnosis and selection of optimal treatment tactics. Difficulties in the diagnosis of GERD are explained by: atypical course of the disease, presence of comorbidities, lack of the "gold standard" examinations.

During recent years, the types of operations for GERD have undergone significant modifications, but the number of postoperative complications remains high. The recurrence rate after HH plastic averages 25%, reaching 60% and can be solved through a comprehensive approach to the diagnosis of GERD combined with HH. The high incidence of postoperative complications, such as dysphagia, gas-bloat syndrome, slipping of the fundoplication cuff and that of esophageal complications (ranging within 2-25%), such as prolonged dysphagia, strictures, esophageal erosion after some types of alloplasty, require a search for ways to eliminate them, careful study of the options of the hiatal plastics' method and the development of reliable fundoplication and methods of its performance.

The main unexplored issues are indications for surgical treatment of patients with GERD, preoperative preparation and diagnostic methods, surgical treatment versus medical one, the advantages of different methods of surgery, laparoscopic surgery compared to open one, technical aspects of operations, prevention of intra- and postoperative complications.

From the performed analysis of long-term results and their comparison with baseline and inter-group data, it follows that in 36 months after surgery there is a statistically significant difference in favor of group I on the average VAS score for reflux symptoms, dysphagia and extraesophageal symptoms, the average score of quality of life according to the GERD-HRQL, mean DeMeester score, distribution of patients by their satisfaction, grade of reflux esophagitis according to the Los Angeles classification, and gas-bloat syndrome.

When applying a new integrated approach to the diagnosis and treatment of GERD, which includes the usage of

proposed modern diagnostic methods, developed by us as well as the method of operation, based upon topographic and anatomical features of the esophageal-gastric junction and adjacent structures, minimally invasive surgery, laparoscopic and endoscopic approaches, usage of developed diagnostic and therapeutic algorithm it is possible to reduce the number of postoperative complications such as: gas-bloat syndrome – 3-fold, dysphagia – 5-fold, GERD and HH recurrences 5-fold and 2-fold, correspondingly, to improve the patients' quality of life in 2.6 times in 36 months after surgery, and to increase the timeliness of diagnosis and the choice of differentiated treatment tactics.

Conclusions

In 36 months after surgery the difference between groups I and II in the number of GERD recurrences was 1.6% vs. 7.7%, that of HH recurrences – 1.6% vs. 3.3%, the difference between groups I and III in the number of GERD recurrences was 1,6% vs. 12.5%, that of HH recurrences – 3.2% vs. 8.3%.

Analysis of results of the GERD surgical treatment have revealed the causes (application of the operative method, technical aspects during the intervention: removal of the hernia sac, expanded mediastinal dissection; hernia size, choice of hernioplasty and fundoplication method, presence of obesity, GERD complications, intensity of postoperative follow-up, surgeon's experience), that lead to the GERD and HH recurrence and allowed to substantiate the indications for the usage of the developed method of complex diagnosis and treatment.

Finding. The source of funding for the publication of the article is the funds of its authors.

Contribution of each participant. The contribution of each author to this work is the same.

Conflict of interest. The authors who participated in this study declare the absence of a conflict of interest regarding this manuscript.

Consent to publication. All authors read and approved the final version of the manuscript and agreed to its publication.

References

1. Fuchs KH, Babic B, Breithaupt W, Dallemagne B, Fingerhut A, Furnee E, et al. EAES recommendations for the management of gastroesophageal reflux disease. *Surg Endosc.* 2014 Jun;28(6):1753-73. doi: 10.1007/s00464-014-3431-z. Epub 2014 May 2. PMID: 24789125.
2. El-Serag HB, Sweet S, Winchester CC, Dent J. Update on the epidemiology of gastro-oesophageal reflux disease: a systematic review. *Gut.* 2014 Jun;63(6):871-80. doi: 10.1136/gutjnl-2012-304269. Epub 2013 Jul 13. PMID: 23853213; PMCID: PMC4046948.
3. Katz PO, Gerson LB, Vela MF. Guidelines for the diagnosis and management of gastroesophageal reflux disease. *Am J Gastroenterol.* 2013 Mar;108(3):308-28; quiz 329. doi: 10.1038/ajg.2012.444. Epub 2013 Feb 19. Erratum in: *Am J Gastroenterol.* 2013 Oct;108(10):1672. PMID: 23419381.

4. McKinley SK, Dirks RC, Walsh D, Hollands C, Arthur LE, Rodriguez N, et al. Surgical treatment of GERD: systematic review and meta-analysis. *Surg Endosc.* 2021 Mar 2. doi: 10.1007/s00464-021-08358-5. Epub ahead of print. PMID: 33651167.
5. Scarpellini E, Ang D, Pauwels A, De Santis A, Vanuytsel T, Tack J. Management of refractory typical GERD symptoms. *Nat Rev Gastroenterol Hepatol.* 2016 May;13(5):281-94. doi: 10.1038/nrgastro.2016.50. Epub 2016 Apr 14. PMID: 27075264.
6. Shimizu Y, Dobashi K, Kobayashi S, Ohki I, Tokushima M, Kusano M, et al. A proton pump inhibitor, lansoprazole, ameliorates asthma symptoms in asthmatic patients with gastroesophageal reflux disease. *Tohoku J Exp Med.* 2006 Jul;209(3):181-9. doi: 10.1620/tjem.209.181. PMID: 16778364.
7. Andreou A, Watson DI, Mavridis D, Francis NK, Antoniou SA. Assessing the efficacy and safety of laparoscopic antireflux procedures for the management of gastroesophageal reflux disease: a systematic review with network meta-analysis. *Surg Endosc.* 2020 Feb;34(2):510-520. doi: 10.1007/s00464-019-07208-9. Epub 2019 Oct 18. PMID: 31628621.
8. Memon MA, editor. Hiatal hernia surgery: An evidence based approach. Cham, Germany: Springer International Publishing; 2018. 309 p. ISBN 978-3-319-64003-7 doi: 10.1007/978-3-319-64003-7.
9. Fomin PD, Grubnik VV, Nikishaev VI, Malinovsky AV. Non-neoplastic diseases of the esophagus. Kiev: Business Intellect; 2008.304 p. Russian. ISBN 978-966-1653-00-8.
10. Kohn GP, Price RR, DeMeester SR, Zehetner J, Muensterer OJ, Awad Z, et al. Guidelines for the management of hiatal hernia. *Surg Endosc.* 2013 Dec;27(12):4409-28. doi: 10.1007/s00464-013-3173-3. Epub 2013 Sep 10. PMID: 24018762.

Received: 10.12.2020