New Day in Medicine
Новый День в Медицине
NDM

TIBBIYOTDA YANGI KUN

Ilmiy referativ, marifiy-ma'naviy jurnal

AVICENNA-MED.UZ

ISSN 2181-712X.
EiSSN 2181-2187

5 (91) 2026

ТИББИЁТДА ЯНГИ КУН
НОВЫЙ ДЕНЬ В МЕДИЦИНЕ
NEW DAY IN MEDICINE

Илмий-рефератив, маънавий-маърифий журнал
Научно-реферативный,
духовно-просветительский журнал

УЧРЕДИТЕЛИ:

БУХАРСКИЙ ГОСУДАРСТВЕННЫЙ МЕДИЦИНСКИЙ ИНСТИТУТ
ООО «ТИББИЁТДА ЯНГИ КУН»

Национальный медицинский исследовательский центр хирургии имени А.В. Вишневского является генеральным научно-практическим консультантом редакции

Журнал был включен в список журнальных изданий, рецензируемых Высшей Аттестационной Комиссией Республики Узбекистан (Протокол № 201/03 от 30.12.2013 г.)

5 (91)

2026
Май

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Received: 20.04.2026, Accepted: 06.05.2026, Published: 10.05.2026

УДК 616.34-007.43+616.329-089.844

ГРЫЖЫ ПИЩЕВОДНОГО ОТВЕРСТИЯ ДИАФРАГМЫ: ТАКТИКА ХИРУРГИЧЕСКОГО ЛЕЧЕНИЯ

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✓ ***Резюме***

Использование разработанного выбора тактики хирургического лечения грыж пищеводного отверстия диафрагмы позволило уменьшить число послеоперационных осложнений и летальность

Ключевые слова: грыжа, пищеводное отверстие диафрагмы, хирургическое лечение

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✓ ***Rezyume***

Diafragmaning qizilo'ngach churralarini jarrohlik yo'li bilan davolash taktikasini tanlash uchun ishlab chiqilgan xirurgik davolashdan foydalanish operatsiyadan keyingi asoratlar va o'lim sonini kamaytirdi.

Kalit so'zlar: churra, diafragmaning qizilo'ngach teshigi, jarrohlik davolash

ESOPHAGEAL HERNIAS: SURGICAL TREATMENT TACTICS

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✓ ***Resume***

The use of the developed choice of tactics for surgical treatment of esophageal hernias of the diaphragm has made it possible to reduce the number of postoperative complications and mortality

Keywords: hernia, esophageal opening of the diaphragm, surgical treatment

Relevance

Despite the broad scope of the topic of hiatal hernias, key issues of significant importance for practical surgery remain unresolved: There is no unified approach to the selection of surgical techniques for different types of hiatal hernias; clear stratification criteria allowing for personalized treatment tactics based on clinical and morphological characteristics have not been developed; there are contradictions in the justification of indications for the use of reinforcing meshes; the relationship between the size of the hernia defect, esophageal motility, and the choice of antireflux correction

method has been insufficiently studied; and the number of studies evaluating surgical outcomes depending on a stratified approach based on objective parameters is limited (1, 2, 4, 6).

Despite the extensive study of hiatal hernias and the significant accumulated clinical experience, the transition from a universal to an individualized surgical approach remains unrealized. This creates a justified need for a systemic study aimed at developing and implementing a stratified approach to the surgical treatment of various forms of GERD with a clinical and morphological justification for the choice of surgical technique (1,3,4,5,7,8).

The objective of the study was to develop an algorithm for selecting a surgical treatment strategy for hiatal hernias**.**

Materials and methods

The analysis was conducted at the Bukhara Regional Multidisciplinary Clinic and covered the period 2015-2025. The total sample consisted of 128 patients with hiatal hernias who underwent laparoscopic surgery. The study was designed in a retrospective-prospective manner.

In accordance with the study methodology, patients were divided into two groups: a control group (63 patients; 49.2%), who underwent surgery between 2015-2019 using a traditional technique (posterior crurorаphy and, in some cases, Nissen fundoplication); and a study group (65 patients; 50.8%), who underwent surgery between 2020-2025 using a modified technique and an algorithmically based selection of the intervention scope. The study design included eight logically sequential stages, starting with a retrospective assessment of the results of traditional surgery (control group) and ending with a comparative analysis of long-term results on an integral scale.

Results and discussion

The following factors had the greatest impact on the likelihood of an unsatisfactory outcome: esophageal dyskinesia, severe weakening of the valve mechanism (Hill III-IV), a high degree of gastric migration (3-4), and the presence of a type III-IV hernia. These features were subsequently included in the multivariate logistic analysis model to develop a prognostic algorithm.

Data analysis demonstrated statistically significant associations between a number of clinical and morphological features and the risk of unsatisfactory outcomes after surgical treatment of hiatal hernia. The following were considered as criteria for an unsatisfactory outcome: hernia recurrence, persistent pathological GER (based on pH-metry and clinical assessment), and the need for repeat surgery within the first year of follow-up. Esophageal motility impairment demonstrated the strongest association with an unfavorable prognosis: in patients with dyskinesia, an unsatisfactory outcome was recorded in 60% of cases, while in those with normal motility, it was only 8.9% (odds ratio, OR = 9.00; 95% CI: 2.40-33.80; p = 0.001), emphasizing the key role of motor function assessment in planning surgical tactics, especially in choosing the fundoplication option and the feasibility of combining it with other stages of the intervention.

The state of the antireflux valve mechanism according to the Hill classification also proved to be a significant predictor: with grades III-IV impairment, an unsatisfactory outcome was observed in 48% of patients, versus 8.6% in the group with grades I-II (OR = 5.75; p = 0.006). This symptom reflects the functional failure of the diaphragmatic zone, which requires at least stabilization measures (for example, gastropexy), and in some cases also strengthening of the diaphragmatic ring.

The Barrett/HPE hernia type also proved significant: in patients with types III-IV, the failure rate was 50%, compared to 12.5% for types I-II (p=0.024). These data demonstrate the importance of considering the morphological type of hiatal hernia when planning intervention. In other words, with large, sliding, and mixed hernias, basic crurorаphy is insufficient.

The degree of gastric migration deserves special attention: with grades 3-4 (subtotal and total displacement of the cardia into the thoracic cavity), the risk of recurrence and functional impairment increased more than fourfold compared to less severe forms of displacement (p=0.018). This result directly substantiates the need to include elements of gastric fixation and additional stabilization of the diaphragm. Finally, the daily acidity indicator also showed a statistically significant association with an unfavorable outcome: with a pH <4 more than 4% of the time, an unsatisfactory result was observed in 47.6% of cases, versus 12.8% with normal values (OR=5.60; p=0.007). This parameter

can serve as an objective criterion for the presence of clinically significant GERD and, accordingly, an indication for expanding the scope of the intervention.

According to the data obtained, the most significant independent prognostic factor was a sign of esophageal motility disorder, in particular the presence of dyskinesia (OR=7.85; 95% CI: 2.10-29.35; p=0.002), which emphasizes the inconsistency of esophageal peristaltic activity, significantly reducing the effectiveness of standard interventions and requiring modification of surgical tactics. The Hill valve mechanism score was the second most influential factor: grades III-IV esophageal-gastric junction impairment was associated with a nearly fivefold increased risk of unsatisfactory outcome compared to grades I-II (OR=4.95; p=0.008). This indicator reflects the degree of functional failure of the gastric valve mechanism and can be considered an indication for the addition of gastropexy or mesh reinforcement.

A high degree of gastric migration (grades 3-4) demonstrated an OR=3.80 (95% CI: 1.20-12.00; p=0.025), indicating the need to stabilize the cardia with fixation or additional reinforcement in cases of significant gastric displacement into the thoracic cavity.

Finally, the Barrett/HPE hernia type (III-IV) retained independent prognostic significance even after adjustment for other variables (OR=2.95; p=0.041), allowing the inclusion of the morphological type of hiatal hernia in the risk score, particularly when assessing hernia sac volume and GERD deformation.

Based on the results of multivariate logistic analysis, an integrated prognostic score was developed to stratify patients according to the risk of developing an unsatisfactory outcome after surgical treatment of hiatal hernia. The score included only those features that retained independent prognostic significance in multivariate regression: Barrett/HPE hernia type, degree of gastric migration, Hill valve status, and the presence of esophageal motility disorders. Each feature was assigned a corresponding weight (point) proportional to its impact on the risk of outcome, estimated using the odds ratio (OR). The most significant factor was esophageal motility disorder, which was assigned a score of 2. Other features (hernia type III-IV, Hill III-IV, degree of gastric migration $\geq$ 3) were assigned a score of 1 each, reflecting their clinical significance but a lesser impact on prognosis than dyskinesia.

Overall, the developed risk stratification scale and algorithm for choosing surgical treatment tactics for hiatal hernias represent a logically formalized system based on a quantitative assessment of clinical and instrumental parameters, which forms the basis for their digital implementation in the form of specialized software.

Given the clear structure of input data (hernia type, degree of gastric migration, valve mechanism parameters, manometry data) and their diagnostic reproducibility, this algorithm can be integrated into a digital platform with artificial intelligence elements, providing automated interpretation of significant parameters and predicting the likelihood of an unsatisfactory outcome. The use of artificial intelligence will allow for real-time recommendations for the optimal surgical intervention for a specific patient, improve the accuracy of clinical decisions, eliminate the variability of human interpretation, and thereby standardize a personalized approach to GERD surgery.

Based on the overall assessment, the following stratification is proposed: 0-1 points: patients with minimal anatomical and functional impairments. They are recommended to undergo modified crurorraphy, typically without additional stages. 2-3 points: intermediate risk zone, in which modified crurorraphy can be supplemented with functional gastropexy to stabilize the cardia and prevent axial displacement. $\geq$ 4 points: high risk of unsatisfactory results with the traditional approach. Patients in this category are recommended to undergo a full modified technique, including crurorraphy with subalarcotic sutures, gastropexy, and placement of a semi-encompassing "saddle" mesh implant.

Our developed algorithm for selecting surgical treatment tactics for hiatal hernia reflects the transition from an empirical approach to a formalized model based on a logistic analysis of objective clinical and instrumental data. The developed risk scale includes predictors with proven independent prognostic value: hernia type, degree of gastric migration, valve mechanism assessment, and esophageal motility. All these parameters allow stratification of patients by risk of unsatisfactory outcomes and, accordingly, determination of the required intervention, ranging from basic crurorraphy to a fully modified technique with gastric fixation and mesh placement.

The algorithm ensures clinical validity, reproducibility, and individualization of surgical approaches for hiatal hernia. The model's application in real-life practice has been validated in clinical cases and reduces the risk of recurrence, functional impairment, and unnecessary extension of surgical intervention. The data obtained form the methodological basis for further systematic evaluation of the results of the proposed approach.

Conclusions

1. The developed modified technique includes three functionally interconnected stages: crural raphy with subalarcotic sutures, gastric fixation, and placement of a semi-loop mesh implant. Each of the listed modifications is aimed at correcting a specific aspect of the anatomical and functional imbalance. Unlike standard approaches, the proposed technique is not universal, but is applied on a case-by-case basis, based on objective diagnostic criteria.

2 The proposed algorithm for selecting a surgical approach minimizes the risk of recurrence and functional failure and improves the reproducibility of surgical decisions.

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Entered 20.04.2026