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ENHANCED RECOVERY PATHWAY AFTER LAPAROSCOPIC HERNIOPLASTY IN PATIENTS WITH VENTRAL HERNIAS: IS IT NECESSARY TO APPLY?

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Summary

The aim: To study the effectiveness of the enhanced recovery after surgery (ERAS) protocol for laparoscopic hernioplasty (LH) in patients with ventral hernias (VH).
Materials and methods: 190 patients with VH after laparoscopic prosthetic hernioplasty with intraperitoneal mesh placement (IPOM) were included in the study and divided into two groups. The study group (ERAS group) included 92 (48.4 %) patients to whom the ERAS protocol was applied, the control group (preERAS group) – 98 (51.6 %) patients. The width of the hernia was more than 10 cm in 25 (13.2 %) patients of the ERAS group. For them botulinum toxin type A (BTA) was injected into the muscles of the anterior abdominal wall 4 weeks before the operation. In the postoperative period, the duration of the operation, hospital length of stay, the intensity of the pain syndrome and well-being, the level of C-reactive protein (CRP) and interleukin-6 (IL-6) on the first postoperative day were evaluated.
Results: After the introduction of BTA in 25 patients of ERAS group, the hernial defect decreased by an average of 4.6±0.62 mm and in all cases became less than 10 cm ($p<0.001$). The average duration of LH in the study and control groups did not differ statistically (ERAS; 91.2±37.41 min vs preERAS 88.9±30.05 min, $p=0.76$). In 2 hours after the operation, it was possible to activate all patients of the study group and 78 (79.6 %) of the control group, within 4-6 hours – the other 20 (20.4 %) patients of the control group. Using the ERAS protocol demonstrated significantly less intensity of pain syndrome according to visual analogue scale (VAS), complaints of nausea ($p<0.001$), bloating ($p=0.017$), feelings of hunger, thirst and general weakness ($p<0.001$). At the same time, there was no statistically significant difference in the presence of defecation ($p=0.31$). The average level of CRP after surgery was significantly higher in the control group compared to the study group (preERAS; 43.63 ± 13.90 vs ERAS; 16.55 ± 9.97, $p<0.001$). The level of IL-6 similarly increased more significantly in the control group (pre ERAS; 34.03 ± 18.18 vs ERAS; 11.44 ± 5.30, $p<0.001$). The length of hospital stay after surgery did not differ statistically between the groups ($p=0.21$).
Conclusions: The use of the ERAS protocol during laparoscopic hernioplasty IPOM for patients with VH can reduce the intensity of the pain syndrome in the postoperative period and increase the patient's subjective assessment of their condition. The use of BTA in the preoperative period allows the implementation of the ERAS protocol even when used with large ventral hernias.

Keywords: **hernia, enhanced recovery, botulinum toxin**

INTRODUCTION

Hernioplasty of VH is one of the most common type of operation in planned surgery, the number of which is increasing [15]. There are two main methods of surgical intervention for hernia – open and laparoscopic. Open operations for the elimination of hernias still occupy a leading position in the treatment of patients with large and giant hernias of the anterior abdominal wall. However, LH continues to gain popularity, especially with the advent of a variety of mesh types to reinforce the anterior abdominal wall. Regardless of the chosen method of performing hernioplasty, the patient's quick recovery and quality of life in the postoperative period is a priority [6].

In the 1990s, H. Kehlet first proposed the concept of enhanced recovery after surgery (ERAS). A new approach to patient management involved reducing stress caused by surgical trauma and introducing a multimodal approach to controlling pathophysiological changes and rehabilitation in the postoperative period [9].

The use of ERAS principles has proven to be effective in open surgery. The advantages of the ERAS protocol implementation are the rapid recovery of the digestive tract function, the reduction of postoperative hospital length of stay and the reduction of repeated hospitalizations [8, 13]. During this time, ERAS protocols for patient management in the pre-, intra- and postoperative period for various types of surgical interventions were not only developed and implemented, but also improved. There are developed guidelines for managing patients during urological, gynecological, oncological, and bariatric types of operations [11]. But for herniology, such ERAS protocols are mostly local, and their elements depend on the specifics of the approach and the capabilities of an individual clinic [4, 12, 16, 18]. The feasibility of ERAS protocol using in LH of ventral hernias is under study.

THE AIM OF THE STUDY

To study the effectiveness of implementing the developed ERAS protocol during laparoscopic hernioplasty in patients with ventral hernias.

MATERIALS AND METHODS

A single-center prospective cohort controlled study was conducted, the object of which was patients with VH. The subject of the study was a therapeutic algorithm (ERAS protocol) for managing patients in the pre-, intra- and postoperative period during the surgical treatment of VH by the method of LH. The study was conducted from 2011 to 2023 yy. at Kyiv City Clinical Hospital No. 3 – the clinical base of the Department of General Surgery No. 2 of Bogomolets National Medical University.

The criteria for inclusion in the study were: the age of patients from 18 to 90 years, referral for the treatment of uncomplicated ventral hernia, compensated concomitant somatic pathology, performing the operation in the planned order, performing laparoscopic prosthetic hernioplasty IPOM.

Exclusion criteria from the study were: age of patients under 18 or older than 90 years, referral for treatment of complicated, including pinched VH, decompensated comorbidities, performing the operation in an urgent order, performing open methods of hernioplasty.

In order to more accurately assess the effectiveness of the implementation of the ERAS protocol, the study also did not include patients who underwent simultaneous operations, LH in combination with other laparoscopic interventions on abdominal organs (cholecystectomy and others). Also, the study did not include patients in whom hernia suturing was performed according to the IROM+ technique, combining laparoscopic access for hernia mobilization and mesh installation with open suturing of the hernia defect. Detailed characteristics of patients included in the study are presented in table 1.

Table 1

Demographic and Pre-operative Data

Characteristic	N (%)
Total number of patients:	190 (100 %)
- women	112 (58.9 %)
- men	78 (41.1 %)
Average age, years	56.7 ± 14.65
Body mass index, kg/m ^{2}	30.85 ± 4.50
ASA score: I	49 (25.8 %)
II	136 (71.6 %)
III	5 (2.6 %)
IV	0
Type of hernia (according to EHS classification):	
primary ventral	116 (61.0 %)
○ small, width < 2 cm	35 (18.4 %)
○ medium, width ≥ 2-4 cm	45 (23.7 %)
○ large, width 4-10 cm	23 (12.1 %)
○ large, width ≥10 cm	13 (6.8 %)
incisional ventral,	74 (39.0 %)
○ W1, width < 4 cm	32 (16.9 %)
○ W2, width ≥ 4-10 cm	30 (15.8 %)
○ W3, width ≥ 10 cm	12 (6.3 %)

ASA, American Association of Anesthesiologists; EHS, European Hernia Society; N – the volume of the research sample; the data are presented as M±SD or abs. (%)

Patients were divided into two groups, comparable in age and gender. The study group included 92 (48.4 %) patients who underwent the ERAS protocol. The control group included 98 (51.6 %) patients who did not use the ERAS protocol and were operated on mainly before 2016 year, before the beginning of the active implementation of the principles of «fast track» surgery in the clinic.

In 25 (13.2 %) patients the width of the hernia defect was more than 10 cm at the initial examination. All these patients underwent intramuscular injections of BTA into

the muscles of the anterior abdominal wall. The procedure was made under ultrasound guidance and neurostimulator control 4 weeks before surgery, according to the developed in the clinic methodology. The volume of injected BTA was 100 IU (BOTOX, Allergan, USA), 50 IU each in the muscles of the anterior abdominal wall on the right and on the left.

ERAS pathway

The key principles of the multimodal approach to reducing intraoperative stress and the systemic inflammatory response in the postoperative period were chosen as the basis of the ERAS protocol. We developed it, based on the available publications on the use of ERAS in abdominal wall repair and patient management ERAS protocols, which we developed for other types of laparoscopic interventions [1, 4, 5, 7, 8, 13, 14, 17, 18]. The ERAS protocol included 3 main stages: preoperative, intraoperative and postoperative. The detailed elements of protocol at each stage are presented in table 2.

Table 2

ERAS pathway for patient with ventral hernia

Element of ERAS protocol	Implementation details
Preoperative period	
Informing and counseling the patient	A detailed conversation with the patient and his relatives regarding the examination plan, the operation, possible complications and the course of the postoperative period.
Optimization of organ function	A standardized examination plan, with its expansion and the involvement of consultants in case of detection of concomitant pathology. Compensation of comorbidities, including diabetes if present.
Refusal of smoking and drinking alcohol	Refusal 1 month before surgery, if possible.
Preparation of the intestine	Patients were advised to stop eating 6 hours, fluids – 2 hours before surgery. Rejection of the use of saline solutions for the purpose of cleansing the intestines.
Saturation with carbohydrates	Consumption of a carbohydrate mixture (5 g of glucose diluted in 200 ml of warm water) 4 hours before the operation.
Intraoperative period	
Antibiotic prophylaxis	Cephalosporins of the II-III generation, 30 min – 1 h before the skin incision.
Reduction of the systemic inflammatory response to stress	Dexamethasone 8 mg IV 20 minutes before the start of the operation.
Oxygen therapy	Preoxygenation to EtO_2 >90 % Sevoflurane inhalation 1 l/min.
Multimodal analgesia	Local anesthesia of trocar insertion points with 0.25 % bupivacaine solution after intubation and before the skin incision. Paracetamol 1000 mg IV once. Fentanyl 0.2 mg (4 ml) before tracheal intubation, then 0.1 mg (2 ml) every 30-60 minutes, focusing on the hemodynamic parameters of the patient. Parecoxib 40 mg IV once.
Optimization of IV infusion	Restrictive type of infusion therapy, < 5 cc/kg/h or < 2 L of IV intraoperatively .
Maintenance of normothermia	Air conditioning in the operating room with maintenance of air temperature not lower than 21^0 C. Use of warming mattresses in the winter period of the year. Administration of infusion solutions heated to a temperature of 36^0 C.
Mini-invasive surgery	Laparoscopic hernioplasty according to the IROM technique.
Thromboprophylaxis	In patients with a BMI < 40 kg/m2 and/or the planned duration of the operation less than 2 hours – bandaging of the lower limbs with elastic bandages during and after the operation. In patients with BMI≥ 40 kg/m2 and/or the planned duration of the operation more than 2 hours – intraoperative pressotherapy followed by bandaging the lower limbs with elastic bandages or wearing compression stockings.
Postoperative period	
Multimodal analgesia with limited use of opioids	Use of non-narcotic analgesics: paracetamol 1000 mg IV every 12 hours for 1-3 days; dexketoprofen 50 mg IV every 8 hours for 1-3 days; diclofenac 100 mg once a day per rectum for 5 days.
Thromboprophylaxis	Injection of anticoagulants of indirect action PC 2 hours after the operation.
Prevention of nausea and vomiting	Administration of medications to prevent complaints: ondosetron 4 mg IV every 12 hours for 1-3 days; metoclopramide 10 mg IV every 8 hours for 1-3 days.
Prevention of intestinal paresis	Drinking regime – non-carbonated water 2 hours after the operation, up to 1 liter on the first post – operative day, continuing without limitation in volume – on the second post – operative day. Enema in case of the absence of defecation within 48 hours after the operation.
Early enteral nutrition	Sipping food 6 hours after the operation with ready-made mixtures.
Early mobilization	Verticalization of the patient 2 hours after the operation.
No catheters and drains	LH did not involve the installation of drains. Indications for the placement of a urinary catheter were an expected operation duration of more than 2 hours, the presence of a hernia below the umbilicus, placement of mesh 20x25 cm or more in size.

IV, intravenously.

In the control group only next elements of protocol were given: in the intraoperative period – antibiotic prophylaxis, oxygen therapy, surgery was performed laparoscopically; in the postoperative period – thromboprophylaxis, early activation if possible, administration of dexketoprofen and ondosetron on request in case of complaints, consumption of 200 ml of water and infusion intravenous therapy with saline solutions depending on the patient's body weight in order to prevent hypovolemia on the first postoperative day.

The characteristics of collected data

In order to evaluate the effectiveness of the application of the ERAS protocol, a standardized list of indicators was collected in both groups: duration of surgical intervention; the presence of intraoperative complications (bleeding, damage to the intestinal wall, others); the need to use narcotic analgesics in the postoperative period; duration of postoperative hospital length of stay; the presence of complications in the early postoperative period (within 30 days from the moment of surgery). Also, all patients filled out a questionnaire developed by us to assess the subjective condition on the first postoperative day. Questionnaire also included assessment of the level of pain syndrome according to the VAS (table 3). In 15 patients with postoperative ventral hernias in each of the groups, the level of CRP and IL-6 was determined 1 day before and 1 day after surgery.

Table 3

Questionnaire to be filled out by the patient on the first postoperative day

Indicator	Score
Pain	1 2 3 4 5 6 7 8 9 10
Nausea and/or vomiting	Present / Absent
Abdominal bloating	Present / Absent
Feeling hungry	1 2 3 4 5 6 7 8 9 10
Feeling thirsty	1 2 3 4 5 6 7 8 9 10
Flatulence	Present / Absent
Defecation	Present / Absent
General weakness	1 2 3 4 5 6 7 8 9 10

Note. The numbers represent the intensity of the patient's subjective feelings, where 1 is the lowest intensity, 10 is the highest intensity.

The criteria for discharging a patient from a hospital were: absence of hyperthermia (body temperature up to 37.50C); the ability of the patient to serve himself without the help of medical personnel; lack of need for injectable forms of analgesics (pain level below 5 when moving according to VAS); transcutaneous oxygen saturation above 92 % without additional oxygen support; consent to hospital discharge.

Before discharge, patients were instructed about the symptoms of inflammatory complications, in the event of which it is necessary to contact the doctor (increase in body temperature above 37.5^0C, soreness, swelling, redness of the skin, any discharge from trocar wounds). Detailed explanations were also given regarding the rules of care for postoperative wounds at home. Control examinations of patients were carried out 2 weeks, 1 month after the operation. During the patient's visit, an ultrasound examination of the anterior abdominal wall was also performed in order to objectify data on the development of local complications and hernia recurrence.

Statistical analysis

Data were analysed with the statistical package IBM SPSS Statistics Base (version 22). All results were considered statistically significant at a value of $p < 0.05$. Quantitative data are presented as mean (M) ± standard deviation (SD), unless otherwise stated. The normality of the data distribution was checked using the chi-square test ($p > 0.05$). For normally distributed data, comparisons were made using paired Student's t-test for related samples and Student's t-test for unrelated samples. For non-normally distributed data the comparison was performed using the Wilcoxon sign rank criterion for related samples and the Wilcox-on-Mann-Whitney criterion for unrelated samples.

RESULTS

In the study group, 25 patients with a hernial defect more than 10 cm at the initial examination, 4 weeks after the injections of BTA, showed a statistically significant decrease in the width of the defect ($p<0.001$) by an average of 4.6±0.62 mm. In all these patients, the width of the hernia defect was <10 cm at the time of hospitalization. We can perform laparoscopic suturing of the hernia defect and LH using the IPOM technique. The ERAS protocol was applied without changes to these patients.

In both groups, patients underwent LH, without conversions and intraoperative complications. Taking into account the use of composite meshes when performing the IPOM technique, LH did not involve drainage of wounds and the abdominal cavity.

The average duration of the operation in the ERAS group was 91.2±37.41 min, in the control group – 88.9±30.05 min. The difference between the duration of the operations between the groups was not statistically significant ($p=0.76$). It should be noted that the groups

included a wide selection of patients with hernia defects from 1.5 to 10 cm, so the duration of operations varied widely from 35 to 200 minutes. Longer duration of operations in both groups was observed in patients with postoperative hernias, where the stage of viscerolysis required additional operating time.

Early activation of the patient and verticalization during the first 2 hours after the operation were possible in all patients in the study ERAS group and in 78 (79.6 %) patients in the control group without using the ERAS protocol. The other 20 (20.4 %) patients of the control group were activated within 4-6 hours from the end of the operation. In all of them the size of the installed mesh was 20x25 cm and the number of tackers used for its fixation was more than 20.

Patients of both groups associated the increase in pain syndrome when straining the anterior abdominal wall, changing the position of the body – with fixing the mesh to the anterior abdominal wall by tackers. At the same time, in both groups, patients subjectively noted a lower intensity of the pain syndrome when lying down at rest or when walking in a straight line. The results of the questionnaire of the study and control groups are presented in table 4. When using the ERAS protocol, there was a significantly lower intensity of pain syndrome according to VAS, complaints of nausea ($p<0.001$), bloating ($p=0.017$), feelings of hunger, thirst and general weakness ($p<0.001$). At the same time, there was no statistically significant difference in the presence of defecation ($p=0.31$).

Table 4

Results of patient questionnaires on the first postoperative day

Indicator	Study group * (ERAS pathway, n=92)	Control group * (preERAS, n=98)	P**
Pain	2,9±0,88	3,3±0,85	<0,001
Nausea and/or vomiting Present / Absent	16 (17,4 %) / 76 (82,6 %)	68 (69,4 %) / 30 (30,6 %)	<0,001
Abdominal bloating Present / Absent	20 (21,7 %) / 72 (78,3 %)	37 (37,8 %) / 61 (62,2 %)	0,017
Feeling hungry	1,66 ± 1,19	3,85 ± 2,55	<0,001
Feeling thirsty	2,64 ± 1,98	4,34 ± 1,97	<0,001
Flatulence Present / Absent	61 (66,3 %) / 31 (33,7 %)	34 (34,7 %) / 64 (65,3 %)	<0,001
Defecation Present / Absent	7 (7,6 %) / 85 (92,4 %)	4 (4,1 %) / 94 (95,9 %)	0,319
General weakness	2,90 ± 2,04	5,07 ± 2,36	<0,001

Note: * n – the volume of the research sample; data are presented as M±SD or abs. (%)
**Comparisons were made for two independent samples using the Wilcoxon W-test

In both groups, a significant increase in the level of CRP and IL-6 was observed after surgery ($p<0.001$). At the same time, the average level of CRP after surgery was significantly higher in the control group compared to the study group (preERAS; 43.63 ± 13.90 mg/l vs ERAS; 16.55 ± 9.97 mg/l, $p<0.001$) and increased more intensively in in the control group without using the ERAS protocol ($p=0.002$) than in study group. A similar trend was observed in the intensity of the increase in the level of IL-6 after surgery (preERAS; 34.03 ± 18.18 pg/ml vs ERAS; 11.44 ± 5.30 pg/ml, $p<0.001$), which also increased more intensively in the control group than in study group using the ERAS protocol ($p<0.001$).

The duration of hospital length of stay after surgery in the groups did not differ statistically ($p=0.21$), and was 1.4±1.56 days in the study group, 1.5±0.55 in the control group. At the same time, the average intensity of pain according to VAS on the first postoperative day was significantly higher in the control group compared to a similar indicator in the study group when using the ERAS protocol (preERAS; 3.3±0.85 vs ERAS; 2.9±0.88, $p<0.001$).

The correlation analysis of the research results showed a direct statistically significant correlation between the size of the hernia defect and the duration of the operation ($r=0.56$; $p<0.05$), the duration of the operation and the length of stay in the hospital after the operation ($r=0 .34$; $p<0.05$), the level of pain intensity according to VAS and the duration of the operation ($r=0.4$; $p<0.05$), the level of pain intensity according to VAS and hospital stay after surgery ($r=0.58$; $p<0.05$).

Infectious complications and signs of wound suppuration in the early postoperative period were not observed in both groups. In 2 (2.1 %) patients of the study group and in 1 (1.0 %) patient of the control group, at the examination 2 weeks after the operation, during the ultrasound examination, accumulation of fluid in the projection zone of the hernial sac was detected. Findings are regarded as seroma formation. In all 3 cases, liquid accumulations were punctuated under ultrasound control, the seromas were evacuated. The further postoperative period in these patients was uneventful. The use of the ERAS protocol in patients with large VH may result in higher rates of seroma formation, since the IPOM technique does not involve removal of the hernial sac. In our study, the difference between the groups was not statistically significant ($p>0.05$).

DISCUSSION

The implementation of the ERAS protocol in the surgical treatment of VH demonstrates its economic feasibility. The increase in the costs of pharmacological

therapy (multimodal analgesia, pharmacotherapy of functional disoders of the digestive tract, infusion therapy and nutritional support) when using the ERAS protocol is offset by a decrease in the total costs of other products during the patient's stay in the hospital [5]. However, this was confirmed mainly for using open methods of hernia suturing [5, 17].

The use of laparoscopic methods of performing surgery can be an element of a multimodal approach to minimize operative trauma [10]. Laparoscopic operations are significantly less traumatic compared to open ones. Although intraperitoneal insufflation of carbon dioxide during laparoscopy provides a certain immunological imbalance, laparoscopic operations lead to a lower systemic inflammatory response compared to open ones [2, 10]. Measurements of the level of CRP and IL-6 are considered indicators of the intensity of the acute-phase response to operational stress [3]. That is why the lower level of increase of these indicators during first postoperative day confirms the superiority of laparoscopic operations over open ones [19]. And in our study – the advantage of using the ERAS protocol even in minimally invasive operations.

Existing research results, including our own, confirm the effectiveness of the implementation of the ERAS protocol both when performing only open suturing of the VH and when performing LH in comparison with open ones [4, 5, 8, 13, 17, 18]. M. Fayezizadeh et al. verified a pilot analysis of 42 patients after open VH repair (with component separation) in a clean surgical field. In comparison with his previous data, the implementation of the ERAS protocol demonstrated a reduction in the duration of recovery of GI function by 1.4 days (5.0 vs. 3.6, $p<0.0001$) and a decrease in the average length of hospital stay by 1.4 days (5.8 vs. 4.4, $p<0.0001$) [4].

There are only several studies about the benefits of using the ERAS protocol specifically for minimally invasive operations in herniology [1, 7, 14]. Minimal intraoperative trauma during laparoscopic suturing of a hernia defect allows to reduce the time of stay in the hospital and the terms of further rehabilitation in comparison with open suturing of the hernia. Therefore, the question of the expediency of using the ERAS protocol during laparoscopic VH repair remains debatable, because such operative interventions are considered as one-day operations.

In our study, there was no significant difference between the conditions of patients in both groups before surgery. In the study group, at the beginning of the operation, in addition to general anesthesia, local infiltration anesthesia was performed at the trocar installation site with a 0.25 % bupivacaine solution. The use of a combination of general and local anesthesia, as well as multimodal analgesia in the postoperative period allowed to minimize pain in the ERAS group. It improved subjective well-being of the patients, but did not affect the duration of the postoperative hospital length of stay even with the implementation of ERAS. However, it is not possible to objectively compare the effectiveness of the use of various elements of the ERAS protocol during LH for patients with VH. This is due to the influence of a wide range of factors, such as weight of the patient, muscle strength, variability of duration of operation, size of the hernia defect, different variants of its suturing or not suturing, the variety of tackers, different sizes of meshes and necessary number of tackers for its fixation, different pain threshold and the subjectivity of the patient's assessment of the severity of the pain syndrome at its low intensity.

CONCLUSIONS

Implementation of the ERAS protocol in patients with VH during laparoscopic hernioplasty IPOM allows to reduce the intensity of the pain syndrome in the postoperative period and improve the patient's subjective assessment of their condition. Enhanced recovery pathway do not significantly affect the patient's hospital length of stay after LH ($p = 0.21$), but its implementation allows for a significant reduction in the intensity of the systemic inflammatory response and the level of CRP and IL-6 growth. Laparoscopic hernia repair using the IPOM technique with implementation of the ERAS protocol can be regarded as a one-day surgery, improve the patient's well-being on the first postoperative day and speed up the recovery of digestive tract functions after surgery. Intramuscular injections of BTA in anterior abdominal wall in the preoperative period makes it possible to implement the ERAS protocol even in patients with large VH.

Prospects for further research. The unification of the elements of the ERAS protocol and the selection of the optimal ones for patients with VH during laparoscopic prosthetic hernioplasty requires further research.

FUNDING AND CONFLICT OF INTEREST

No special funding was provided for the study. Authors have no conflict of interest to declare.

COMPLIANCE WITH ETHICAL REQUIREMENTS

In this study the authors adhered to the Ethical Principles for Medical Research Involving Human Subjects outlined in the World Medical Association's Declaration of Helsinki and current Ukrainian regulations. The study protocol was approved by the ethics committee of the Bogomolets National Medical University. The written informed consent was obtained from all the patients.

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Резюме

ПОКРАЩЕНИЙ ШЛЯХ ВІДНОВЛЕННЯ ПІСЛЯ ЛАПАРОСКОПІЧНОЇ ГЕРНІОПЛАСТИКИ У ПАЦІЄНТІВ З ВЕНТРАЛЬНИМИ ГРИЖАМИ: ЧИ ПОТРІБНО ЗАСТОСОВУВАТИ?

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Мета. Вивчити ефективність впровадження розробленого протоколу швидкого відновлення (ERAS) після операції при виконанні лапароскопічної герніопластики (ЛГ) у пацієнтів з вентральними грижами (ВГ).

Матеріали та методи. В дослідження включено 190 пацієнтів з ВГ після лапароскопічної протезуючої герніопластики з інтраперитонеальним розміщенням сітки (IPOM), які були розділені на дві групи. В дослідну групу увійшли 92 (48.4%) пацієнта, яким було застосовано ERAS протокол, в контрольну групу 98 (51.6%) пацієнтів. У 25 (13,2%) пацієнтів дослідної групи ширина грижі була більше 10 см, за 4 тиж до операції їм виконували введення ботулотоксину типу А (БТА) у м'язи передньої черевної стінки. В післяопераційному періоді оцінювали тривалість операції, час перебування в стаціонарі, інтенсивність больового синдрому та самопочуття, рівень С-реактивного білка (СРБ) та інтерлейкіну-6 (ІЛ-6) в першу післяопераційну добу.

Результати. Після введення БТА у 25 пацієнтів ERAS групи грижовий дефект зменшився в середньому на 4,60,62 мм та в усіх випадках став менше 10 см (p0,001). Середня тривалість ЛГ в дослідній та контрольній групі статистично не відрізнялась (ERAS; 91,2±37,41 хв. vs preERAS 88,9±30,05 хв, p=0,76). Через 2 год після операції було можливим активізувати всіх пацієнтів дослідної групи та 78 (79,6%) контрольної групи, впродовж 4-6 годин інших 20 (20,4%) пацієнтів контрольної групи. При використанні ERAS протоколу спостерігалась достовірно менша інтенсивність больового синдрому за візуальною аналоговою шкалою (ВАШ), скарги на нудоту (p0,001), здуття живота (p=0,017), відчуття голоду, спраги та загальної слабкості (p0,001). При цьому статистично значимої різниці в наявності випорожнень не спостерігалось (p=0,31). Середній рівень СРБ після операції був достовірно вищій в контрольній групі в порівнянні з дослідною (preERAS; 43,63 ± 13,90 vs ERAS; 16,55 ± 9,97, p0,001). Рівень ІЛ-6 аналогічно вище зростав в контрольній групі (preERAS; 34,03 ± 18,18 vs ERAS; 11,44 ± 5,30 p0,001). Тривалість перебування в стаціонарі після операції в групах статистично не відрізнялась (p=0,21).

Висновки. Використання ERAS протоколу у пацієнтів з ВГ при виконанні лапароскопічної герніопластики IPOM дозволяє знизити інтенсивність больового синдрому в післяопераційному періоді та покращити суб'єктивну оцінку свого стану пацієнтом. Застосування БТА в передопераційному періоді дозволяє реалізувати ERAS протокол навіть у пацієнтів з вентральними грижами великих розмірів.

Ключові слова: **грижа, покращений шлях відновлення, ботулотоксин**