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# RESULTS OF STUDIES OF STRESS HORMONES DURING SURGERY IN PATIENTS WITH ABDOMINAL HERNIATION AND COMBINED SURGICAL PATHOLOGY OF THE ABDOMINAL CAVITY ORGANS

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# ҚОРИН ЧУРРАСИ ВА ҚОРИН БЎШЛИҒИ АЪЗОЛАРИНИНГ ХИРУРГИК ПАТОЛОГИЯСИ БЎЛГАН БЕМОРЛАРНИ ОПЕРАТИВ ДАВОЛАШДА СТРЕСС ГОРМОНЛАРНИ ТЕКШИРИШ НАТИЖАЛАРИ

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# РЕЗУЛЬТАТЫ ИССЛЕДОВАНИЙ СТРЕСС-ГОРМОНОВ ПРИ ОПЕРАТИВНОМ ВМЕШАТЕЛЬСТВЕ У БОЛЬНЫХ ГРЫЖАМИ ЖИВОТА И СОЧЕТАННОЙ ХИРУРГИЧЕСКОЙ ПАТОЛОГИЕЙ ОРГАНОВ БРЮШНОЙ ПОЛОСТИ

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***Резюме.*** *Вентрал чурра билан оғриган 197 нафар бемор хирургик даволаш натижалари таҳлил қилинди, шундан 104 (52,8%) нафар беморга симультан операция бажарилди, яъни қорин бўшлиғи аъзолари хирургик патологияси ва қорин олд девори чурраси бир вақтнинг ўзида бартараф этилди. 20,1% беморга операциянинг симультан босқичи алоҳида минилапаротом кесим орқали амалга оширилди. Аллопластиканинг таранглашган усули 48,2% ҳолатда бажарилди, таранглашмаган усули – 51,8%, шундан 26,4% беморларга дерматолипидэктомия бажарилди. Қорин бўшлиғи чурраси бўлган беморларда қорин бўшлиғи ва қорин девори органларида бир вақтнинг ўзида операциялар пайтида стресс гормонлари даражасини ўрганиш шуни кўрсатдики, хирургик агрессия даражасига кўпроқ қорин олд деворини таранглашган усулда пластика қилиш ва операция давомийлиги таъсир қилди. Операциянинг қорин бўшлиғи аъзолари патологиясини бартараф этиш босқичи стресс-гормонлар даражаси ўзгаришига айтарли таъсир этмади.*

***Калит сўзлар****: вентрал чурра, симультан патология, хирургик бартараф этиш.*

***Abstract.*** *The results of surgical treatment of 197 patients with ventral hernias were analyzed, while 104 (52.8%) patients underwent simultaneous operations to correct surgical pathology of the abdominal cavity and anterior abdominal wall. In 20.1% of patients, the simultaneous stage of the operation was performed from separate mini-laparotomy access. Tension methods of phalloplasty were performed in 48.2%, non-tension methods-in 51.8%, and 26.4% of patients underwent dermatolipidectomy. The study of the level of stress hormones during simultaneous operations on the abdominal cavity and abdominal wall organs in patients with ventral hernia showed that the degree of surgical aggression was more influenced by the "tension" method of anterior abdominal wall plastic surgery and the duration of the operation. Performing the stage of surgery to correct the pathology of the abdominal cavity did not significantly affect the level of stress hormones.*

***Key words:*** *ventral hernia, simultaneous pathology, surgical correction.*

**Introduction.** The incidence of concomitant surgical diseases of the abdominal cavity in patients with ventral hernias ranges from 11.8 to 46.3%. At the same time, pathology is most often detected in the gallbladder, in women - in the pelvic organs. Simultaneous interventions in patients with hernias have their characteristics, since the location of the organs in which there is a pathology may not coincide with the location of the hernia. Special problems can be caused by the presence of obesity, adhesive disease, chronic and subacute intestinal obstruction [5, 7, 8, 10, 11, 12].

Prevention and treatment of abdominal and extra-abdominal complications, which reach 35%, remains a complex problem, which is often associated with surgical aggression, aspects of which are insufficiently studied in simultaneous operations [2, 4, 7]. All this requires justification of the possibility of performing simultaneous operations based on the results of an operational trauma study.

**Research objective:** justification of simultaneous operations in patients with the ventral hernia and concomitant pathology of the abdominal cavity from the position of "surgical stress".

**Research material and methods.** In 2014-2019, we operated on 197 patients with ventral hernias. Of these, 104 (52.8%) patients were the main group, who underwent simultaneous interventions for diseases of the abdominal cavity that require surgical correction. 93 (47.2%) patients underwent hernioplasty only, they were the comparison group.

The age of patients at the time of surgery was from 16 to 78 years (mean age 49.4+11.8 years), female patients prevailed: 108 (54.8%) women, 89 (45.2%) men.

The study methods met the clinical standards recommended by WHO and the Ministry of Health of the Republic of Uzbekistan - assessment of the general condition, detection of concomitant diseases, and the degree of their compensation; - general clinical laboratory tests, to assess changes in the neuroendocrine response during surgical interventions, the perioperative dynamics of prolactin, cortisol, and thyroxine levels were studied ($T_4$) and thyroid-stimulating hormone

They followed the SWR classification by J. P. Chevrel and A.M. Rath (approved at the XXI International Congress of Herniologists in 1999).

**Research results.** Median localization hernias(MWR) were the most numerous group - 184 (93.4%), lateral abdominal hernias(LWR) - 13 (6.6%) patients. In 20 (10.2%) patients, a ventral hernia was found ($W_1$), 50(25.4%)-average ($W_2$), at 69 (35%) - large ($W_3$), at 58 (29.4%) - huge ($W_4$) sizes. 174 patients with postoperative ventral hernia were admitted (88.3%) of patients, with the first detected – 23 (11,7%). In our study, the overwhelming number of patients was 127 (64.5%) with postoperative hernias of the median localization of large sizes.

A total of 104 patients in the main group revealed 178 simultaneous pathologies of the abdominal cavity that required surgical correction (28 patients – 2 simultaneous pathologies, 6 – 3). Most often, patients with ventral hernias revealed cholelithiasis - 29 (27.8%), pelvic pathology in women – 31 (30.7%), abdominal adhesions - 67 (64.4%), obesity III-IV st. saggy stomach-32 (30.7%), etc. Simultaneous pathology was diagnosed at the preoperative stage in 74.6%, intraoperative-in 25.4%.

Summary data on the treatment of patients with hernias showed that with an increase in the size of hernias, the number of patients requiring simultaneous interventions increased. In small hernias (W1), 16 (15.3%) simultaneous pathologies were revealed, in W2 – 31 (29.8%), in W3 – 62 (59.6%), and W4 - 69 (66.3%).

65.4% of patients in the main group and 61.3% in the comparison group had concomitant somatic pathology that required perioperative preparation: - diseases of the cardiovascular system (40.6%); - respiratory organs (11.8%); - diabetes mellitus (4.3%); - obesity of the III-IV stages (28.7%), etc.

When patients were distributed according to the degree of operational and anesthetic risk (according to ASA), 52.8% of patients corresponded to class I, 36.5% to class II, and 10.7% to class III. The preoperative training program included artificial hypertension of the abdominal cavity using a special belt-bandage (utility model-pneumatic belt-bandage IAP 2016 0046).

When surgical diseases were located at a wide distance from each other, each pathology was operated on through separate accesses. In general, in the main group, 21 patients (20.1%) underwent a separate operation to correct surgical pathology of the abdominal cavity. In all 21 patients, the simultaneous stage of the operation was performed using mini-laparotomy access. In 83 patients (79.8%), all stages of the operation were performed using a single herniolaparotomy access.

Then the main stage of the operation was done performed-elimination of the hernial defect. In both study groups, the choice of hernioplasty was differentiated (table 1).

For various constitutional features, taking into account the risk of tissue tension affecting the course of the postoperative period, 49 patients in the main group and 46 in the comparison group underwent combined plastic surgery – the aponeurosis defect was sutured edge to edge with additional reinforcement of the suture line with polypropylene mesh. This made it possible to create optimal conditions for the formation of a strong postoperative scar.

**Table 1.** Types of hernioplasty in the main group and the comparison group

| Type of operation | Main group | | Comparison group | | Total |
|---|---|---|---|---|---|
| | abs. | % | abs. | % | |
| Stretch methods of alloplasty | | | | | |
| Implantation of the "onlay" endoprosthesis with defect suturing (+DLE) | 49 (4) | 47,1 | 46 (3) | 49,5 | 95 (7) |
| Non-burdensome methods | | | | | |
| Implantation of the "onlay" endoprosthesis without suturing the defect (+DLE) | 44 (19) | 42,3 | 38(12) | 40,9 | 82 (31) |
| Implantation of the "onlay" endoprosthesis without suturing the defect with mobilization of the rectus abdominis vaginas by Ramirez (+DLE) | 11 (9) | 10,6 | 9(5) | 9,7 | 20 (14) |
| Total | 104 | 100 | 93 | 100 | 197 (52) |

**Table 2.** The nature of operations performed in patients who were studied for stress hormones

| Type of operation | Number of patients | |
|---|---|---|
| | abs. | % |
| Simultaneous operations in the main group of patients | | |
| HE + stretch hernioalloplasty through a single access | 4 | 28,6 |
| MLHE + stretch hernioalloplasty through separate accesses | 5 | 42,8 |
| MLCE + non-tensioned hernioalloplasty via separate accesses | 5 | 28,6 |
| Hernioplasty in the comparison group | | |
| Stretch hernioalloplasty | 4 | 40,0 |
| Non-tensioned hernioalloplasty | 6 | 60,0 |

Patients with a high risk of tissue tension and increased intra-abdominal pressure to increase the volume of the abdominal cavity and prevent the development of compartment syndrome (44 patients in the main group and 38 in the comparison group), anterior abdominal wall plastic surgery was performed in a non - tensioned way, i.e. mesh was applied to the aponeurosis without suturing it. In 19 (9.6%) patients with grade III obesity, when there was a high risk of excessive tissue tension during suturing and a high probability of eruption of sutures, we applied non-tensioned alloplasty with mobilization of the rectus abdominis vaginas according to Ramirez. The advantages of this technique are that the mobilization of the rectus abdominis vagina allows you to evenly distribute and significantly reduce the pressure on the tissues during suturing. The use of an allograft helps to strengthen the suture line and creates optimal conditions for the formation of a full-fledged scar. 52 patients who had concomitant pathology in the form of grade II-III obesity after the completion of anterior abdominal wall plastic surgery also underwent dermatolipidectomy (DLE), along the line previously applied to the anterior abdominal wall before surgery, bordering the hernial protrusion, old postoperative scar, and Castanares skin–fat fold. The weight of the excess skin-fat flap was from 4 to 12 kg. After completion of hernioalloplasty-implantation of the "onlay" endoprosthesis without suturing the defect patients in the study groups were left with a perforated Redon drainage tube, the free ends of which were removed below the horizontal incision and fixed to the skin, according to indications, depending on the volume of surgery for aponeurosis. Abdominal complications in the early postoperative period such as intestinal paresis and urinary retention were noted in the main group in 5 (4.8%) patients, in the comparison group – in 4 (4.3%). Extra abdominal complications of the bronchopulmonary and cardiovascular systems developed in 6 (5.7%) patients of the main group and also in 6 (6.4%) of the comparison group. The development of compartment syndrome occurred in 2 cases, one in each study group. Among the wound complications, hematomas were noted in 3 and 1, seromas in 4 and 3, lymphorrhea in 1 and 2, and necrosis of the skin flap edge in one case in each group. For a comparative assessment degrees traumatic of surgical intervention in patients with a ventral hernia (n=10) and in patients with the ventral hernia and concomitant surgical pathology of the abdominal cavity (n=14) in the perioperative period, we studied the state of stress hormones (prolactin, cortisol, thyroid hormones), which objectively show the traumatic nature of the surgical intervention (table 2).

The patients studied in the groups were identical (p Anesthesia method: - combined intravenous anesthesia based on ketamine (1.5-2 mg/kg) with benzodiazepine-type drugs (diazepam-0.14 mg/kg) and fentanyl (2.8 mcg/kg). Control over the adequacy of anesthesia was carried out according to generally accepted criteria: indicators of hemodynamics and gas exchange, acid-base state of capillary blood, he-

moglobin and hematocrit levels, ECG. When studying stress hormones in the perioperative period, it was found that before surgery, the average prolactin values ranged from 246.2 ± 21.6 to 283.0 ± 113 Miu / ml, which was within the average norms. In the examined patients, the baseline cortisol level ranged from 252.1 ± 42.6 to 342.1 ± 48.2 nmol / L, which was also within the normal range. Baseline thyroid hormone levels ($T_4$ TSH), which are functionally associated with the pituitary gland and change during various surgical interventions ranged from 70.8±8.86 to 82.4±5.7 ng/dl and from 2.21±0.51 to 1.68±0.4 mIU/L, respectively. The level of prolactin was studied during the main stages of surgical intervention and at all subsequent stages of treatment. Intraoperative analysis of the results of laboratory tests of blood hormones showed that in both groups the level of prolactin changed evenly, but at some stages of the operation, a sharp increase in prolactin was noted in both groups. Such changes were noted at runtime hernioalloplasty by tension method. At the same time, there was no increase in prolactin levels during the stage of surgery to remove the gallbladder, however, an increase in prolactin levels was observed with an extension of the duration of the operation. On the 2nd day after surgery, there was a similar trend towards normalization of prolactin in both groups. The deviation from the initial data was +59% and +70% in the main and comparison groups, respectively. On days 7 and 10 after surgery, the prolactin level decreased to baseline equally in both groups of patients. The maximum increase in cortisol levels was also observed at the main stage of the operation (+106.5%). When examining changes in cortisol levels in the example of a patient who underwent herniolaparotomy and cholecystectomy through one approach with tension hernioplasty from the main group and in a patient from the comparison group who also underwent tension hernioplasty, a uniform change in hormone levels in both groups was also revealed with an abrupt rise at the stage of hernioalloplasty. However, since the simultaneous operation was longer, the increased cortisol level lasted 15 minutes longer. The tendency to normalize the cortisol content in the postoperative period was observed equally in both groups of patients. During the operation, the T level is$_4$ patients in both groups had lower baseline values. In the postoperative period, a significant increase in the level of T was detected$_4$ both patients who underwent hernioalloplasty and patients who underwent simultaneous surgery for a ventral hernia and surgical pathology of the abdominal cavity (12.9%). The level of TSH deviation compared to baseline data was equally higher in both study groups. The degree of its deviation from the initial data in the postoperative period was higher (+48.1%) than during the operation (+15%).

**Discussions.** In response to any surgical intervention, systemic pathophysiological changes occur in the body, the severity of which is determined by the initial state of the patient and the traumatic nature of surgical aggression. With simultaneous operations that have an additional stage, and in some cases, additional access to pathologically altered abdominal organs, the" post-aggressive reaction " of the body will be more pronounced than with isolated operations, which makes many surgeons refrain from simultaneous operations for combined surgical diseases of the abdominal cavity. According to Petrov (2011), immediately after the onset of stress, the hypothalamic-pituitary-adrenal system and the adrenergic system are activated, which leads to an increase in the concentration of glucocorticoids and catecholamines in the blood and target organs. High concentrations of these hormones in the body dramatically activate carbohydrate metabolism, which leads to an increase in the concentration of glucose in the blood. The high sugar content stimulates the secretion of insulin by the pancreas, which increases the permeability of cell membranes to glucose and stimulates its utilization by cells. In parallel, the metabolic products of catecholamines activate the peroxidation of membrane lipids, thereby increasing the fluidity of cell membranes, the activity of membrane-bound enzymes, changing the permeability of membranes for ions, the number of receptors and other properties of membranes, which ultimately stimulates the functional activity of cells. A high concentration of catecholamines and glucocorticoids leads to a temporary decrease in resistance due to the parallel activation of catabolic processes: stimulation of protein breakdown, tissue destruction by activated proteolytic and lipolytic enzymes. These changes depend on the strength, duration, and nature of the stress factor (9,12). The data of our studies allow us to conclude that with surgical intervention for ventral hernia and simultaneous surgery for a ventral hernia and concomitant surgical pathology of the abdominal cavity, the increase in hormone levels is observed evenly in both groups. The increase in hormone levels was influenced not by the simultaneous stage of the operation, but by the stage of performing hernioalloplasty by a tension method and a significant lengthening of the duration of the operation. The abrupt rise in the level of certain hormones during simultaneous surgery coincides with the stage of tension hernioalloplasty, which is a rather stressful factor associated with the tension of the peritoneum, rich in nerve endings. It should also be noted that the return to the initial level of stress hormones occurred equally in both groups of patients, which, is associated with the same injury to muscle tissues during surgery. Thus, the study of the level of "stress" hormones showed that the longer the operation, the more fluctuations are observed from the initial level. In general,

the conducted studies showed that the most pronounced changes in the studied hormones in the direction of their increase occurred equally in both groups when performing the stage of surgery – hernioalloplasty by the tension method, and by the second day after the operation, there was an identical return to the initial level.

**Conclusions.** The study of the level of stress hormones during simultaneous operations on the organs of the abdominal cavity and abdominal wall in patients with ventral hernia showed that the degree of surgical aggression was more influenced by the "tension" method of plastic surgery of the anterior abdominal wall and the duration of the operation.

Performing the stage of surgery to correct the pathology of the abdominal cavity did not significantly affect the level of stress hormones, which justifies the possibility of performing simultaneous operations for abdominal hernias and combined abdominal pathology from the positions of "surgical stress".

Performing the simultaneous stage of the operation as a whole did not negatively affect the results of surgical treatment of patients with the ventral hernia and simultaneous pathology of the abdominal cavity. At the same time, getting rid of several diseases in a single anesthetic aid and surgical intervention justifies the need to perform simultaneous operations.

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## *РЕЗУЛЬТАТЫ ИССЛЕДОВАНИЙ СТРЕСС-ГОРМОНОВ ПРИ ОПЕРАТИВНОМ ВМЕШАТЕЛЬСТВЕ У БОЛЬНЫХ ГРЫЖАМИ ЖИВОТА И СОЧЕТАННОЙ ХИРУРГИЧЕСКОЙ ПАТОЛОГИЕЙ ОРГАНОВ БРЮШНОЙ ПОЛОСТИ*


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***Резюме.*** *Проанализированы результаты хирургического лечения 197 больных с вентральными грыжами, при этом 104 (52,8%) пациентам выполнены симультанные операции по коррекции хирургической патологии органов брюшной полости и передней брюшной стенки. 20,1% больным симультанный этап операции выполнен из отдельного минилапаротомного доступа. Натяжные способы аллопластики выполнены 48,2%, ненатяжные – 51,8%, при этом 26,4% больным выполнена дерматолипидэктомия. Изучение уровня стрессовых гормонов при выполнении симультанных операций на органах брюшной полости и брюшной стенки у больных с вентральной грыжей показало, что к степени хирургической агрессии в большей степени влияло проведение "натяжного" метода пластики передней брюшной стенки и продолжительность операции. Выполнение этапа операции по коррекции патологии органов брюшной полости значимо не влияло на уровень стрессовых гормонов.*



***Ключевые слова****: вентральная грыжа, симультанная патология, хирургическая коррекция.*