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Improvement of safety of surgical interventions in patients with ventral and postoperative ventral hernia under conditions of different types of hernioplasty

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Abstract

The progress of surgery is impossible without continuous analysis of medical errors and complications, without identifying and eliminating their causes for the development and implementation of measures to improve the safety of surgical interventions.

Objective: to develop technical preconditions for improving the safety of surgical interventions in this category of patients according to the results of surgical treatment of patients with primary and incisional ventral hernias.

Materials and methods. Between 2001 and 2017, 1419 patients with primary ventral hernia and incisional hernia underwent surgical intervention. The distribution of patients into groups occurred according to the periods of surgical treatment of patients: from 2001 to 2009 and from 2010 to 2017. In the first period, 597 (42.07 %) patients were examined and operated. These patients formed a comparison group. The main group in the period from 2010 to 2017 made 822 (57.93 %) persons.

The results of investigation. In the period from 2010 to 2017, the technique of preventive hernioplasty was used in 124 (15.08 %) patients. The decrease in the number of such operations in 2.53 times compared with the comparison group is explained by the wider introduction to the surgical practice of alloplastic methods of surgical intervention. However,

this operation remains the method of choice in the following cases: when small hernial defects in young people, in the absence of morbid obesity and syndrome of undifferentiated connective tissue dysplasia (UCTD); in patients of senile and elderly age with a high comorbidity index and higher classes of anesthetic-operational risk (class according to ASA III-IV); and in the absence of the technical skills of the alloplastic methods of hernioplasty of the operating surgeon. In the main group of operating patients, the dominance of using the “sublay” method was noted – 354 (52.21 %) versus 209 (30.83%) of the “on lay” method and 90 (13.27 %) of the “inlay” method. In addition, in this group 45 (5.47 %) patients underwent the method of anatomical separation of the anatomical components of the anterior abdominal wall (CST). Among them, 20 (44.44 %) – in the original performance and 25 (55.56%) – in combination with the use of PPM.

Conclusions. An individualized approach to each individual patient significantly reduced the number of both early and local as well as late postoperative complications. The technical improvement of the existing methods of hernioplasty and the development of new ones greatly reduced the number of postoperative complications and increased the safety of surgical interventions in patients with ventral and incisional ventral hernia.

Key words: ventral hernia; incisional hernia; complications; surgical treatment.

Introduction. Surgical treatment of patients with primary ventral hernia (PVH) and incisional hernia (IH) continues to be one of the most important problems in the surgery of the abdominal cavity [5, 9]. The increase in the number and complexity of surgical interventions on the abdominal organs resulted in an increase the number of incisional hernias. It is proved that 60 % of patients with IH are of working age, which determines the problem of treatment of such patients not only as medical but also as a social [10, 12]. Considering the results of surgical treatment of IH, a significant percentage of relapses should be noted, which is 4.3–46 %. Today, the surgery of PVH and IH accumulated extensive experience in the application of various methods of surgical interventions [1, 6]. The progress of surgery is impossible without a constant analysis of medical errors and complications, without identifying and eliminating their causes for the development and implementation of measures to prevent medical errors. Surgical treatment of defects in the anterior abdominal wall using the auxiliary alloplastic materials become dominant over the last decade. The use of meshes in the treatment of ventral hernias increased up to 95 %. Thanks to the successes of modern polymeric chemical technologies, the interest of surgeons in allergenoplasty renewed, which led gerniology to a new qualitative level of development and gave impetus to the wide

introduction of modern alloplastic surgical interventions [4, 8]. In addition, adherence to the principle of tension free plasty and the use of synthetic materials at the modern stage further reduced the number of recurrences in alloplasty of PVH and IH up to 2–7 %.

The incisional hernias that arose during the first year, most authors associate with early postoperative complications from the wound and abdominal cavity [7, 11]. However, there is a risk of their occurrence, especially in cases where the inappropriate method of alloplasty is chosen [2, 3]. The development of general postoperative complications that arise in the early postoperative period and lead to lethality requires a detailed analysis of the reasons for their occurrence and the development of individualized indications before choosing the method of surgery.

Objective: according to the results of the surgical treatment analysis of patients with primary and incisional ventral hernias, to develop technical preconditions for improving the safety of surgical interventions in this category of patients.

Materials and methods. From 2001 to 2017, 1419 patients with primary ventral hernia (PVH) and postoperative ventral hernia (POVH) underwent an in-depth comprehensive clinical-instrumental and laboratory examination in accordance with the goals and objectives of the study on the basis of the Department of Surgery of the Research Institute of Postgraduate Education of Ternopil State Medical University (Surgical Department of Ternopil Town Communal Hospital No. 2). The distribution of patients into groups was according to the periods of surgical treatment of patients. For this purpose, two periods were formed: from 2001 to 2009 and from 2010 to 2017. In the first period, 597 (42.07 %) patients were examined and operated. These patients formed a comparison group. The main group, corresponding to patients who were treated in the period from 2010 to 2017, made 822 (57.93 %) persons.

In case of PVH M1 defects in the comparison group and the main group were 7 (2.45 %) and 15 (4.36 %) respectively; M1-3 – 186 (65.03 %) and 225 (65.41 %), respectively; M3 – 86 (30.07 %) and 73 (21.22 %), respectively. There were no defects in M4-5 in both groups among primary hernias. L4 defects were observed in 7 (2.45 %) and 31 (9.01 %) of the operated patients in both groups. Defects of other localizations (L1-L3) were not found.

Analysis of localization and distribution of anterior abdominal wall defects in patients with IH in the comparison group showed that M1-3 was noted in 232 (74.60 %), M4-5 – in 51 (16.40 %) patients. M1-5 in this group was not detected; L1, L2, L4 defects – 17 (5.47 %); ML combined defects – in 11 (3.53 %) cases. In contrast, the following localization and distribution of defects in the anterior abdominal wall were diagnosed in the main group

among postoperative ventral hernias (n = 478): M1-3 – 297 (62.13 %), M4-5 – 63 (13.18 %), and M1-5 – in this group in 47 (9.83 %) persons; L1, L2, L4 defects – in 23 (4.81 %). Combined ML defects in this group were found in 48 (10.05 %) patients.

The distribution of types of surgical interventions in patients with PVH and IH in different study periods are presented in Table 1.

Table 1.

Types of hernioplasty	Comparison group (n=597)		Main group (n=822)		Total (n =1419)	
	Absolute	%	Absolute	%	Absolute	%
Tissue hernioplasty	314	52.59	124	15.08	438	30.86
“Inlay”	17	2.84	90	10.94	107	7.54
“Onlay”	254	42.54	209	25.42	463	32.62
“Sublay”	12	2.01	354	43.06	366	25.79
“CST” (components separation technique)	-	-	20	2.43	20	1.41
“CST” (components separation technique) + PPM	-	-	25	3.04	25	1,78
Total	597	100	822	100	1419	100

The results of investigation. In the period 2001–2009, tissue hernioplasty was performed in 314 (52.59 %) patients. The highest proportion of performed autoplasty was observed in patients with umbilical hernia 86 (27.39 %), the hernia of the white abdominal line was 74 (23.57%) and the diastase of the abdominal muscles was 68 (21.65 %). Characterizing the IH that were eliminated by this technique were only small (5–6 cm in diameter), isolated epigastric by localization (M1) hernia after performed in the history of laparotomy.

Analyzing the types of tissue hernioplasty itself performed in the comparison group, we can state the predominance of Mayo and Sapezhko methods. In liquidation of IH, in most cases, a continuous proline suture or PDS loop was used as it most closely corresponded to the principle of anatomical comparison of homogeneous tissues.

Although the majority of surgical interventions in the main group were already performed using polypropylene mesh (PPM), in the period from 2010 to 2017, the method of tissue hernioplasty was used in 124 (15.08%) patients. The decrease in the number of such operations 2.53 times compared with the comparison group is explained by the wider introduction into surgical practice of alloplastic methods of surgical intervention. However, this operation remains the method of choice in the following cases: with small hernial defects in young people, in the absence of morbid obesity and syndrome of undifferentiated

connective tissue dysplasia (UCTD); in patients of senile and elderly age with a high comorbidity index and higher classes of anesthetic-operational risk (class according to ASA III-IV); and in the absence of the technical skills of the alloplastic methods of hernioplasty of the operating surgeon.

The largest proportion of performed autoplastics in the main group was in patients with umbilical hernia 67 (54.03 %). Other localizations of PVH in this observation period were mostly eliminated by implantation methods. In 27 (21.78 %) patients with IH due to the high comorbidity index (6 and more) and the intra- and postoperative risk of development of general complications (pulmonary artery thromboembolia, myocardial infarction, acute cerebrovascular event) in which there was a ventral hernia small in size and mainly middle by localization, the tissue hernioplasty was performed, mainly by continuous prolene suture or using PDS. Dermatolipectomy was performed additionally in 45 (14.33 %) patients with tissue hernioplasty in the comparison group and in 25 (20.16%) persons from the main group. It supplemented autogerioplasty of PVH and POVH of different types in both groups.

Alloplastic methods of surgical treatment in the comparison group were used in 283 (47.40 %) patients, in the main group – in 678 (82.48 %) patients. Between 2001 and 2009, the “onlay” method was 254 (89.75 %) among alloplastic methods. Techniques such as “inlay” and “sublay” were used only in 17 (6.00 %) and 12 (4.24 %) cases, respectively.

While in the period from 2010 we already notice the predominance of the use of the “sublay” method – 354 (52.21 %) versus 209 (30.83 %) of the “on lay” method and 90 (13.27 %) of the “inlay” method. In addition, in this group in 45 (5.47 %) the method of anatomical separation of the anatomical components of the anterior abdominal wall (CST) is performed. Among them, 20 (44.44%) – in the original performance and 25 (55.56 %) – in combination with the use of PPM.

The “onlay” method remains universal in most cases, as its implementation among all aloplasty methods is technically the simplest, as well as the absence of PPM contact with internal organs. Among the disadvantages of this technique, which according to our observation led to a decrease in the number of its implementation in 2.68 times compared with the comparison group, there is a more traumatic mobilization of subcutaneous fatty tissue, which leads to significant damage to the lymphatic and blood vessels, which in the early postoperative period promotes the formation of seroma, hematoma, prolonged lymphorrhage and infiltrates.

Only in 29 (12.24 %) patients aged 20–44 years, this method was used. This is due to the fact, that in the remote postoperative period, the results of functional activity of patients

were significantly lower than with the use of the "sublay" method. Therefore, it is clear that the prevalence of this method of hernioplasty for the age of 45–60 years is 229 (38.29 %) and 205 (35.10 %) over 60 years.

In the first observation period (2001–2009), this method was most often used due to imperfect surgical techniques for of “sublay” and “CST” methods. On the other hand, two or more relapses with severe scar tissue changes in the anterior abdominal wall in the area of the hernia defect, didn’t always give the technical ability to perform the separation of anatomical structures for further reconstructive recovery.

However, despite the widespread introduction of the "sublay" and "CST" method from 2010, the number of operations performed on the "onlay" type significantly decreased, but remained 209 (30.83 %), that is, almost every third patient. This can be explained by the technical simplicity of the implementation of this method, which mainly significantly reduces the duration of the operation. Therefore, it remains relevant as a method of choosing to eliminate small ones that do not accompany the development of the abdominal compartment syndrome (ACS) in the postoperative period of IH in persons of senile age and with the average and high indexes of comorbidity. Advantage of this method before tissue hernioplasty in the treatment of this group of patients is still to strengthen the line of sutures PPM, which provides greater reliability of the surgical intervention and reduces the likelihood of the development of relapse.

In the comparison group, ACS developed in 9 (3.54 %) patients because large hernias in the period of 2001–2009 were mostly eliminated by the “onlay” method. Rarely, increased intraabdominal pressure after the closure of the hernia defect was taken into account and unloading additional resection of the greater omentum or right hemicolectomy was not performed.

Then, as in the period from 2010, for the prevention of the development of ACS in patients with a high comorbidity index in the presence of ventral hernia (W2 and more), the method of choice was surgical interventions by type of “sublay” and "CST" methods. In cases of lack of technical capabilities to perform these types of surgical interventions, the method of choice remained "onlay" operation supplemented with resection of the greater omentum and intraoperative monitoring of intraabdominal pressure using of Kron’s method. As a result, ACS was not observed in the main group after the performed allohernioplasty.

In both observation periods, with almost identical frequency, there are various early local, on the wound side, postoperative complications. Especially they are expressed in

patients with morbid obesity, diabetes mellitus, which is more common in the older age group (Table 2).

Table 2.

	Comparison group (n=254)			Main group (n=209)		
	20–44 years	45–60 years	>60 years	20–44 years	45–60 years	>60 years
Prolonged lymphorrhea	4 (1.57 %)	11 (4.33 %)	13 (5.12%)	2 (0.96 %)	7 (3.35%)	10 (4.78 %)
Seroma	8 (3.15 %)	21 (8.27 %)	27 (10.63%)	5 (2.39 %)	17 (8.13%)	18 (8.61 %)
Hematoma	2 (0.79 %)	17 (6.69 %)	5 (1.97 %)	3 (1.43 %)	8 (3.83%)	3 (1.44 %)
Infiltrate	3 (1.18 %)	20 (7.87 %)	4 (1.57 %)	1 (0.48 %)	9 (4.31%)	2 (0.96 %)
Marginal skin necrosis	1 (0.39 %)	6 (2.36 %)	3 (1.18 %)	-	5 (2.39%)	2 (0.96 %)
Suppuration	1 (0.39 %)	2 (0.79 %)	2 (0.79 %)	1 (0.48 %)	4 (1.91%)	2 (0.96 %)

We improved the technique of performing the “onlay” technique by using bipolar electrocoagulation with permanent irrigation of the wound surface with a cold solution of antiseptic, which creates a reliable hemostasis with minimal negative influence of thermal energy of the coagulator (Fig. 1).

Figure 1.



In addition, several improvements were made in the main group aimed at the prevention of wound complications in the early postoperative period

The "inlay" technique was performed on the whole in 107 (7.54 %) persons. In most cases, this method was used by us in the absence of the technical possibility of tension and reduction between the edges of aponeurosis in the area of a hernia defect, a high risk of development of cardio-pulmonary complications. We saw this method as a "palliative" surgical intervention in patients of senile and elderly age (Table 3).

Table 3.

	Comparison group (n=17)			Main group (n=90)		
	20–44 years	45–60 years	>60 years	20–44 years	45–60 years	>60 years
“inlay” method	-	9 (52.94 %)	8 (47.06 %)	11 (12.22 %)	31 (34.44 %)	48 (53.33 %)

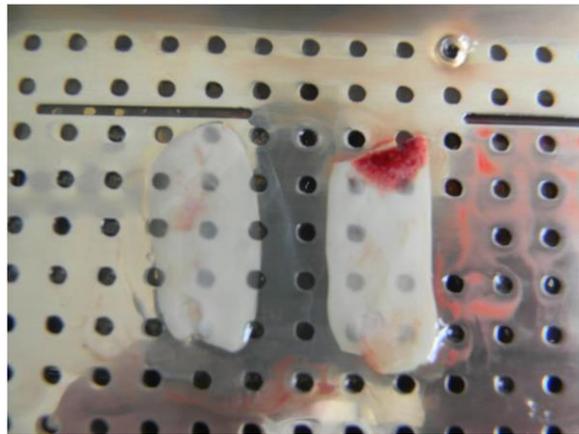
The lack of tissue tension when performing this method of hernioplasty led to the absence of development of ACS in the postoperative period in both periods of the study. This was provided by intraoperational control of intra-abdominal pressure by treating an adequate size of "heavy" PPM, which allowed, if necessary, even to create an additional volume in the abdominal cavity.

The "sublay" technique, without a doubt, corresponds to the principle of reconstructive surgical intervention regarding the surgical treatment of PVH and IH and is the basic method. Unfortunately, not always operative surgeons perfectly possess the technical methods of performing this method as it is more complicated, and also there are not always conditions for its application in expressed cicatricial changes in the area of the hernia defect, especially in the second, third and more recurrences. In 15.25 % of the operated patients of the main group, together with the PPM, PRF membrane was additionally used. The use of it contributed to the increase in activity of fibroblasts and the formation of collagen fibers around the material of the mesh. This is also confirmed by a decrease in the number of local complications that are predictors of the development of relapse.

PRF (Platelet Rich Fibrin) membrane contains a significant amount of leukocytes, platelets and stem cells. Growth factors present in it in a significant number contribute to the proliferation and regeneration of connective tissue cells, which contributes to the process of integration of PPM into the tissue muscle-aponeurotic layer of the anterior abdominal wall. This is especially important in patients with connective tissue dysplasia syndrome, which had

been observed since the early years of degradation of the connective tissue skeleton of aponeurosis with the formation of PVH and the early relapse of IH. The received PRF membranes from the blood taken in a patient intraoperatively (Fig. 2), were stirred directly above the mesh implant under the direct muscles of the abdomen for better contact with the latter (Fig. 3).

Figure 2.



Depending on the area of the used mesh, 6 to 8 PRF membranes were used.

Figure 3.



From the second day, there was no discharge from the drainage of the retro-muscular space. During the sonographic study, there was a lack of seromas, hematomas, tissue edema. This allowed to remove drainage for the second postoperative day in these patients.

The technical improvement of polypropylene mesh fixation in the "sublay" technique was the method of fixing the polypropylene mesh when performing retro-muscular allohernioplasty, which foreseen the preliminary stitching of the edges of the cut-out PPM with a monofilament thread with the remaining free ends up to 15–20 cm (Fig. 4).

Figure 4.



After stitching the posterior surface of the sheath of rectus muscle of abdomen, PPM was placed behind the rectus muscles (retromuscularly). On the skin of the anterior abdominal wall, using a scalpel No. 11 we made punctures, which corresponded to the location of the free ends of the thread. Under visual control, to prevent traumatism of the internal organs using Veresh needle we performed a puncture of the muscular aponeurotic layer in the retromuscular space. Alternatively, free edges of polypropylene thread were expelled outward and bundled with each other, thus obtaining uniform placement and tension of PPM without the formation of a free floating surface and secure fixing of the latter (Fig. 5, 6).

Figure 5.



The application of this improvement contributed to more reliable fixation, even stretching under the muscles of the PPM with the absence of its additional protrusions, which excludes the possibility of formation of seromas and separation-rejection of the mesh with the formation of cysts.

Figure 6.



The use of this method also prevented such complications as the stitching of PPM to the posterior surface of the sheath of rectus muscle of abdomen with retraction of the wall of the small or large intestine, especially when in order to prevent the occurrence of ACS resection of the greater omentum was performed, and the intestinal tract in this case remained uncovered, that, in turn, leads to the development of peritonitis in the early postoperative period or the formation of external fecal fistulas.

After fixing PPM, the free regions of the anterior sheath of rectus muscle of abdomen were stitched between each other. Additional punctures on the skin were not stitched (Fig. 7).

Figure 7.



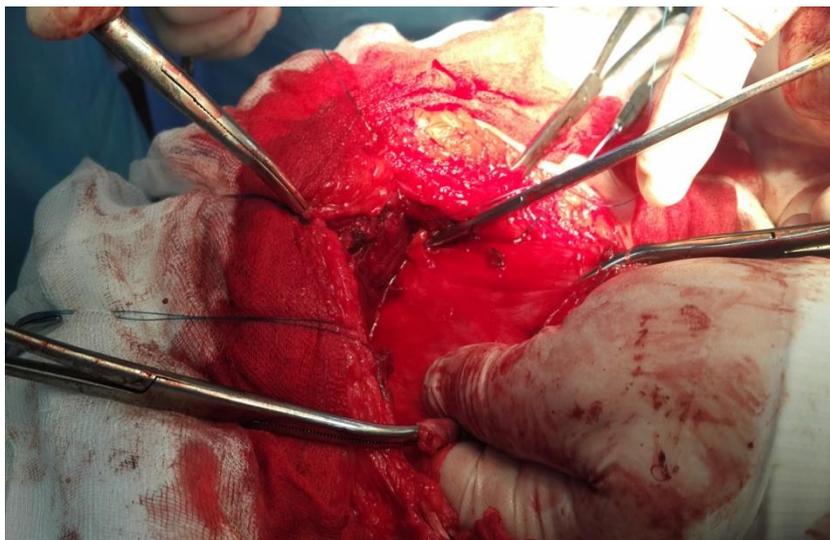
A month after surgery, during the control examination, the anterior abdominal wall of was as follows. (Fig. 8).

Figure 8.



The next technical improvement in the "sublay" allohernioplasty was the method of fixing the polypropylene mesh under the conditions of the implementation of the retro-muscular allohernioplasty, which assumes, after the elimination of the hernia defect, the dissection of the sheath of rectus muscle of abdomen, the separation of these muscles from the posterior surface of the sheath of rectus muscle. Before stitching of posterior surface the sheath of rectus muscle when abdominal cavity opening under visual control we put on several prolene sutures on the posterior surface of the sheath of rectus muscle (Figures 9, 10).

Figure 9.



Conduction of ligatures across all layers of the sheath of rectus muscle with the parietal peritoneum provides a reliable fixation of the implant, while preventing possible iatrogenic damage to the internal organs during a surgical intervention. Later, after applying

the fixing sutures, we stitch the free edges of the posterior sheath of rectus muscle together with the peritoneum (Fig. 11).

Figure 10.

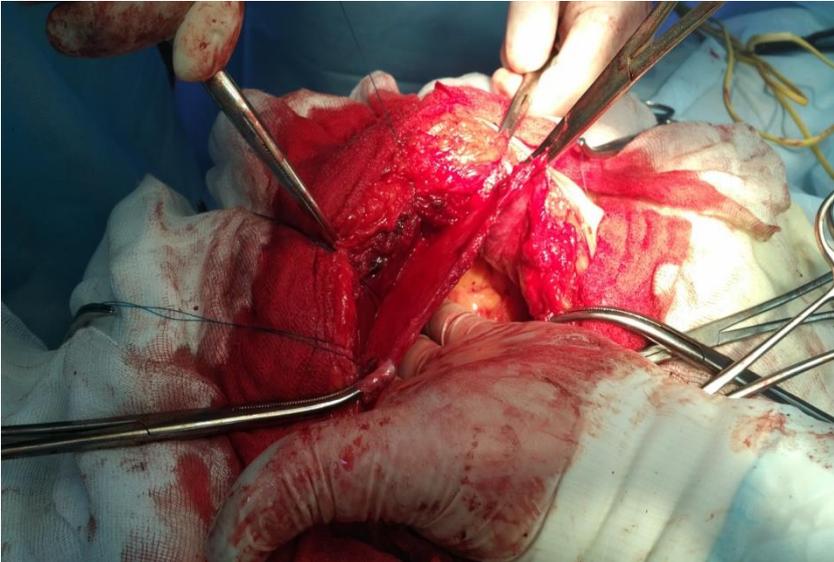
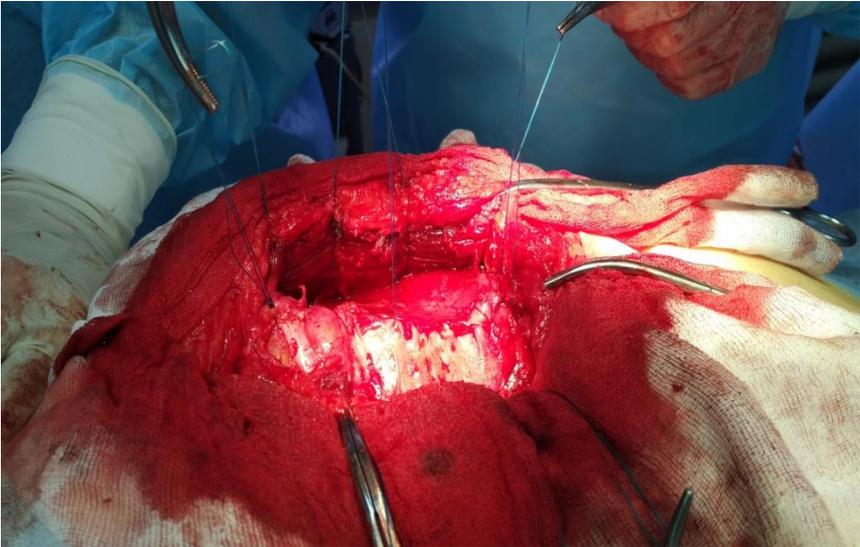


Figure 11.



To the already formed ligatures in the posterior sheath of rectus muscles, we fix the PPM (Fig. 12). This enhancement is aimed at safer and more reliable (through all layers) stitching of prolene ligatures for PPM fixation.

In order to optimize the treatment of PVH and IH in the "sublay" method in patients with high comorbidity index and high anesthetic-operational risk (ASA III-IV) in order to reduce the traumatism and reduce the duration of surgery we proposed a method of fixing the

polypropylene mesh when performing retro-muscular allohernioplasty with a use of surgical glue Katsil (Fig. 13).

Figure 12.

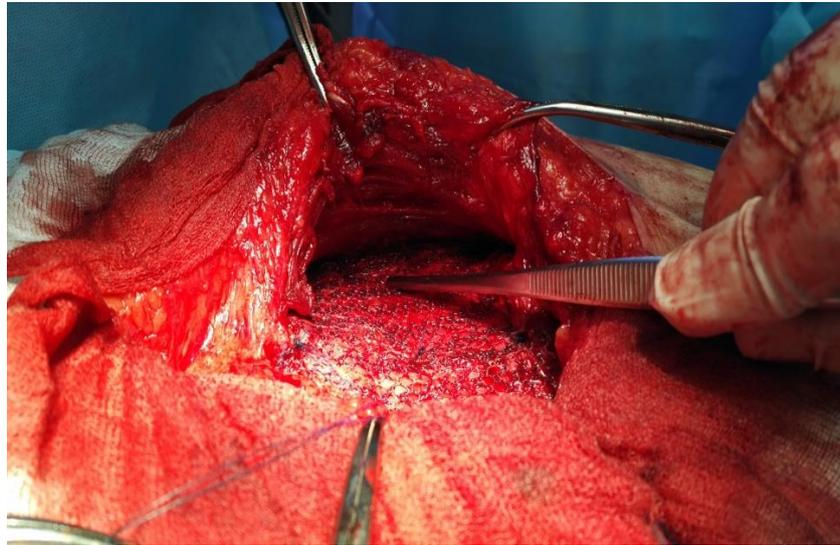


Figure 13.



After stitching between the free edges of the posterior sides of the sheath of rectus muscle, the latter, when satisfactorily hemostasis, are dried and degreased by the alcohol solution of Lugol. From above put a uniformly shaped by size PPS and quickly put on a uniform layer of surgical glue Katsil. After 5 minutes a reliable mesh fixation is observed (Fig. 14). Drainage of retro-muscular space when the application of this method of fixation was not performed.

Figure 14.



Due to the application of newly developed and improved existing methods of alohernioplasty, such as "sublay", we managed to achieve a decrease in the number of early local complications (Table 4).

Table 4.

Complications	Comparison group (n=12)		Main group (n=354)		
	minor PPM	severe PPM	minor PPM	minor PPM +PRF	severe PPM
Hematoma	1 (8.33 %)	4 (33.33 %)	4 (1.29 %)	-	8 (2.26 %)
Infiltrate	2 (16.67 %)	3 (25.0 %)	6 (1.69 %)	-	11 (3.11 %)
Marginal necrosis	1 (8.33 %)	2 (16.67 %)	2 (0.56 %)	1 (0.28 %)	5 (1.41 %)
Suppuration	-	2 (16.67 %)	-	-	2 (0.56 %)

Discussion of results: Thus, in particular with the use of "severe" PPM in both groups, the percentage of hematoma significantly decreased from 33.33 % to 2.26 %, infiltrates – from 25.0 % to 3.11 %, suppuration – from 16.67 % to 0.56 %

In the group of operated patients using the "minor" PPM + PRF, the membranes of local complications were practically not observed except in one case (0.28 %) of the formation of a marginal necrosis that arose in a female patient undergoing alohernioplasty by the type of "sublay" supplemented by dermatolipectomy with respect to obesity degree II.

The surgical interventions for the separation of anatomical components of the anterior abdominal wall (CST) under the Ramirez foundation, which is the phased separation of the

structures of the anterior abdominal wall to increase the volume of the abdominal cavity, such as the reduction of the hernial sac content at large and giant POVH, can lead to a significant increase of intra-abdominal pressure and ACS development, closing the hernia defect as much as possible with its own tissues.

In the present conditions, a combined method that involves the separation of anatomical components of the abdominal wall (CST) by Ramirez and the implementation of “onlay” hernioplasty is used more often. This technique, as well as insulated without a mesh, can significantly reduce the frequency of ACS. However, there is a high incidence of local wound complications, caused not only by the high surgery injury but also by the presence of quite large mesh sizes, in most cases "heavy".

The method in our study was used in 45 (3.17 %) patients. It was performed only in patients of the main group. All of the patients were with POVH of large and gigantic (W3 and more) sizes. The distribution of patients by age and type of performed CST is given in (Table 5)

Table 5

	Main group (n=45)		
	20–44 years	45–60 years	>60 years
CST (n=20)	-	14 (31.11 %)	6 (13.34 %)
CST+PPM (n=25)	8 (17.78 %)	10 (22.22 %)	7 (15.56 %)

According to the data using the combined method (CST + PPM), 25 (55.56 %) patients were operated. Like any alloplastic hernioplasty technique, such a combination is more reliable and accompanied by fewer relapses. Therefore, as we can see from the table, it was used in 8 (17.78 %) young patients with large and giant POVHs, in whom it was not possible to perform “sublay” and “onlay” alohernioplasty due to the high risk of developing ACS. These patients remained active after the surgery, as most of them were of working age. 7 (15.55 %) patients, for the increase of volume of the abdominal cavity additionally underwent a resection of a greater omentum. In no case, right-sided hemicolectomy was not performed.

Among patients of the elderly age groups who had moderately high comorbidity index (4–6), allowing to expand the volume and as a consequence the duration of surgical intervention, this type of combined alohernioplasty was performed in 10 (22.22 %) and 7

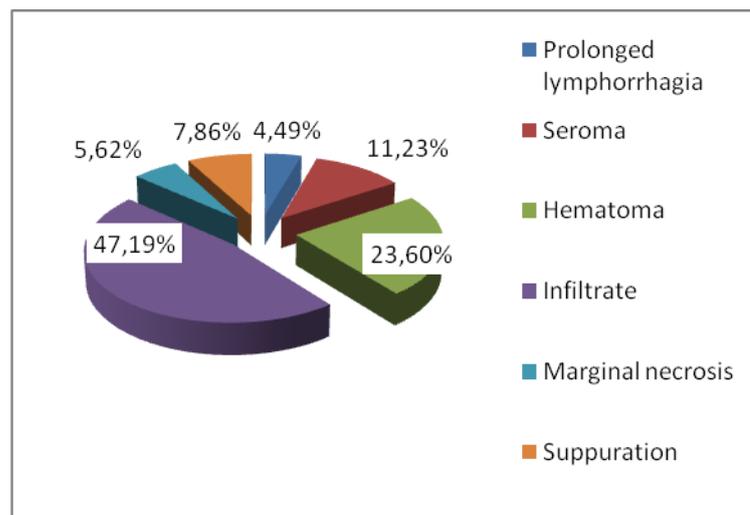
(15,56 %) persons respectively. 20 (44.44 %) patients with a high comorbidity index (6 and more) underwent this technique without using PPM.

During this type of surgical intervention, special attention was given to monitoring and control of intra-abdominal pressure.

Due to conduction of controlled analgesia in the first 24–72 h after surgery, stomach decompression, spasmolytic therapy, prokinetic agents, semi-spirituos compresses on the abdomen, and early mobilization of patients on the second day of the postoperative period – all these measures contributed to the fact that the development of ACS was not recorded in any case. Although we noted the presence of other severe complications of the early postoperative period. Among them, 2 (4.44 %) – PATE, 9 (20.00 %) – pneumonia, 3 (6.67%) – myocardial infarction and 1 (2.22 %) patient – acute cerebrovascular event.

Nevertheless, local complications were often encountered in the course of this surgical intervention. Their frequency and distribution are shown in (Fig. 15).

Figure 15.



Taking into consideration a small group of patients treated with this technique and short-term observation periods, recurrence of hernia was not observed.

Conclusions. 1. The clear evolution of surgical methods for treating ventral hernias – from tension (own tissue, “onlay”) to tension free (“sublay”, “inlay”, “CST”) and also from the use of “heavy” to “light” polypropylene meshes was noted.

2. The indicated features of the dynamics of the used methods of surgical interventions and types of polypropylene meshes in an individualized approach to each individual patient were reflected in a significant decrease in the number of both early of the local and general

and late postoperative complications, which improved the effectiveness of surgical treatment of patients with primary and postoperative ventral hernias.

3. The technical improvement of the existing methods of hernioplasty and the development of new ones greatly reduced the number of postoperative complications and increased the safety of surgical interventions in patients with ventral and incisional ventral hernia.

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