



Development of Alloherinoplasty Method for Hernias of the Anterior Abdominal Wall, For the Prevention of the Development of Paraprosthentic Ventral Hernia: A Case - Control Study

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Keywords: New method of allohernioplasty; Residual cavity; Postoperative ventral hernia; Ventral hernias; seroma; Infiltrate; Bleeding; Suppuration.

Abstract

Background: Hernia surgery and excision are the most frequently performed general surgical interventions. More than 350,000 of such operations are performed annually in the USA alone, and in Europe this Figure is 450,000, which leads to high costs for full treatment and further rehabilitation.

Methods: According to a study by Poulouse, it was found that the United States annually spends an average of about 3.2 billion dollars on the treatment of patients with ventral hernias. In cases of recurrent hernia, each patient can reach up to \$65,000. Ventral hernias, especially postoperative hernias (POH), account for up to 20-22% of all abdominal hernias and occupy second place after inguinal hernias.

Results: The most common type of hernia of the anterior abdominal wall in both groups is primary hernia, 40% (46 out of 115) in the comparison group, and 39.4% (41 out of 104) in the main group. Of the main group, 80 (76.9%) patients used a new surgical method for which a patent for the invention was obtained. All 80 patients were operated on using the Onlay method.

Conclusion: In general, postoperative complications occurred in 17.5% of patients in the main group, which was 1.92 time less common than in the comparison group (33.7%) ($\chi^2=19.5$; Df=6; significant $p<0.003$). Late postoperative complications developed in 39/17.8% of patients (out of 219 patients), of which 30/26.08% were in the comparison group, and only 9/8.6% of patients in the main group, which is 3 times less common than in the comparison group ($\chi^2=49$; Df=1; significance $p<0.05$).



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Introduction

According to Agaev B.A., even with the current development of modern minimally invasive surgical treatment techniques, open-type surgical interventions on abdominal organs are quite common due to circumstances. According to the literature, it is well known that every year in the United States, more than 2 million operations are performed with a frequency that is carried out by traditional open methods on the abdominal organs. Hernia surgery and excision of ventral hernias are predominantly performed as general surgical interventions. In recent years, there has been an increase in the number of cases of wound infection, formation of intra-abdominal adhesions, migration of the prosthesis and other complications in the literature, followed by the development of a paraprostatic hernia [1,2].

According to world statistics, more than 20 million hernias are performed annually, which corresponds to 10-15% of all surgical interventions. But considering the fact that only about 13-15% of patients go to healthcare institutions for surgical care, the actual number of patients with hernias may exceed the number of operated on by many. Elderly and senile patients with obesity, reduced ability to regenerate, as well as the presence of many concomitant factors are the leaders in the frequency of hernia occurrence and further recurrence after surgical ventral hernia (POH).

About 20-22% of all cases of external hernias of the abdomen are POH, which ranks 2nd in terms of frequency of cases, after inguinal hernias [3]. The development of recurrent hernia of the abdominal wall, as a complication, after laparotomy occurs in more than 5% of all operated patients [4-6].

The frequency of development of POH after various types of surgery in the abdominal cavity is as follows:

In 6% of cases, POH is observed after removal of the cervoid process of the caecum (appendix);

In 10% of cases, POH is detected after surgery on the stomach;

In 14% of cases, POH is observed after cholecystectomy;

The lion's share of cases of POH development is observed after emergency type of operations [7].

Even now, the problem of prevention of postoperative ventral hernias is relevant and has medical, social and economic significance [8].

At the same time, recurrent hernias remain a primary problem, which indicates the need to specify indications for existing treatment options, ways to eliminate the defect of the anterior abdominal wall, and develop prognostic scales while taking into account risk factors for the development of various options for surgery. In this regard, targeted research is needed to develop new tactical approaches to choosing the method of surgical intervention, as well as to improve methods of preventing postoperative complications; So as to improve the results of surgical treatment and prevention of postoperative complications of ventral hernias.

Background/rationale

In this study, we aim to present an allohernioplasty method for treatment of hernias of the anterior abdominal wall, and prove its effectiveness for the prevention of the development of paraprostatic ventral hernia.

Objective

Materials and methods

For this research, ethical approval was obtained and this research was performed as part of an open retrospective analysis for the comparison group and a promising one for the main group with randomization by localization, size, and type of performed plastic surgery for ventral hernias. The work is based on the results of treatment of primary, as well as recurrent hernias on the abdominal wall in 219 patients treated from 2018 to 2023 in two medical institutions of the Khorezm region.

4 study design

Khorezm Regional Multidisciplinary Medical Center - 151 (68.9%) patients; Khiva Regional Medical Association - 68 (31.1%) patients

Setting: describing locations

The criteria for inclusion in the study were:

The age of patients over 18 years old;

The presence of a hernia of the anterior abdominal wall, except inguinal;

Primary and recurrent forms of ventral hernias;

Patients who have no absolute contraindications to herniation;

Consent of patients to reconstructive or alloplastic surgical methods for the treatment of ventral hernias.

Eligibility criteria

Criteria for exclusion from the study:

Age of patients under 18 years of age;

Herniators who have absolute contraindications to surgery;

Emergency abdominal wall hernias;

Patients who have refused surgery who prefer wearing a bandage.

Non-eligibility criteria for patients

The preoperative complex of diagnostic examination of patients with hernia of the anterior abdominal wall included a detailed study of complaints, anamnesis of illness and life, physical examination. The instrumental part of the diagnosis of abdominal hernias was carried out with the inclusion of ultrasound (ultrasound) and radiation methods of examination of the abdominal cavity into the complex of examination of the patient, revealing formations, the characteristic chamber, shapes, sizes and the presence of contents. Ultrasound was performed without prior preparation, "Chisom" devices were used, Model: CBIT 8 Sn 123040786 (Germany).

The research material was subjected to statistical processing in spreadsheets, the IBM SPSS statistical 23 computing program was used for comparative analysis, and the Origin Pro 12.69.05326 program was used to draw diagrams. To verify the reliability of the results, the Pearson agreement criterion or χ^2 was used, which is the most convenient method for analyzing frequency changes arranged in conjugacy tables for unrelated groups. Also, finding the number of degrees of freedom Df. The verification value is reliably $p <$, less than 0.05 / 5%.

Taking into account the indicated directions, all patients were divided into two groups for the study. 115 patients (52.5%) were included in the comparison group who received treatment for the period from 2018 to 2021 inclusive, who underwent a retrospective analysis of the results of various interventions for ventral hernias. According to the data obtained, the optimization of tactical approaches to the choice of surgical tactics for abdominal wall hernia was carried out, of which the clinical effectiveness was evaluated in the main study group - 104 (47.5%) patients cured during the period from 2021 to 2023.

Data sources/measurement

Types of intervention: Surgical hernia treatment was performed in all patients included in the study. All types of surgical treatment of abdominal wall hernias (onlay, sublay and inlay) were used in the surgical treatment of patients. However, the new method of allohernioplasty was introduced to the patients in the main group but for only the onlay position.

Potential bias

Results: When studying the prevalence of one or other types of anterior abdominal wall hernias between the main and comparison groups, the following results were obtained:

Table 1: Distribution of patients by type of hernia (CLINICAL CHARACTERISTIC OF STUDY PARTICIPANTS).

Hernias	Comparison Group		Main Group		Total	
	abs.	%	abs.	%	abs.	%
Primary hernia	46	40	41	39,4	87	39,7
Primary postoperative hernia	39	33,9	36	34,6	75	34,2
Recurrent postoperative hernia	24	20,9	21	20,2	45	20,6
Recurrent post-prosthetic hernia	6	5,2	6	5,8	12	5,5
Total	115	100	104	100	219	100

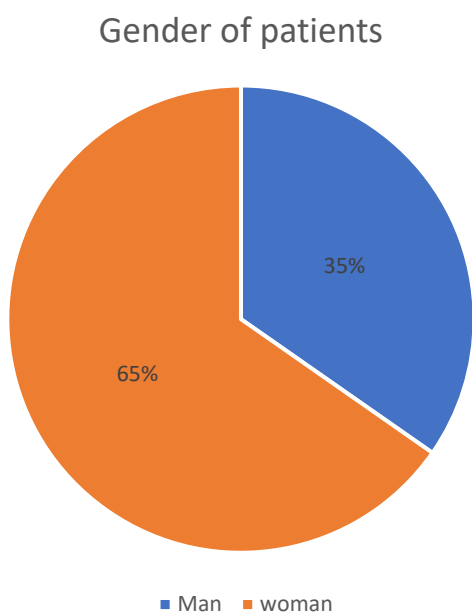


Figure 1: Distribution of patients by gender.

As can be seen from table 1 above, the most common type of anterior abdominal wall hernia in both groups is the primary hernia. Following it is the primary postoperative hernias, and then the recurrent postoperative hernias; with the most rare being the recurrent post-prosthetic hernia. The percentage ratio between the groups in the frequency of hernia types is comparable to both groups (Table 1).

Figure 1 above shows that female representatives are the leaders in the frequency of ventral hernias, which is 65.29% (143 out of 219), and male representatives are 34.71% (76 out of 219).

Descriptive data: demographic characteristics of study participants

Table 2: Distribution of patients by gender and age (OUTCOME DATA).

Age	Men		Women		Total	
	abs.	(%)	abs.	(%)	abs.	(%)
Comparison Group						
18 – 44	24	58,7	46	62,2	70	60,9
45 – 59	11	26,8	19	25,6	30	26
60 – 74	4	9,7	6	8,1	10	8,8
75 – 90	2	4,8	3	4,1	5	4,3
Total	41	100	74	100	115	100
Main Group						
18 - 44	20	57,1	38	55,1	58	55,8
45 – 59	9	25,7	17	24,6	26	25
60 – 74	3	8,6	9	13,1	12	11,5
75 – 90	3	8,6	5	7,2	8	7,7
Total	35	100	69	100	104	100

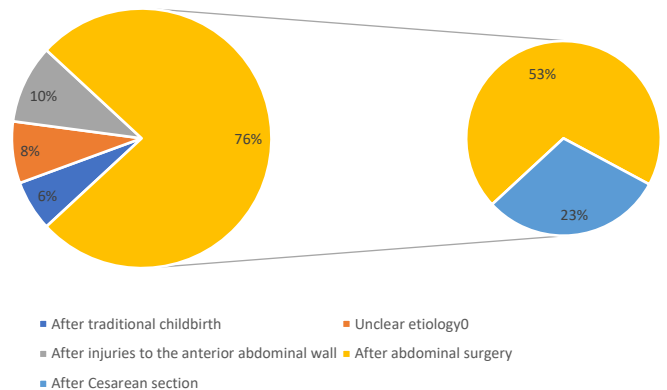


Figure 2: Distribution of female representatives according to the etiology of ventral hernia.

When distributing patients by age groups, the following data were obtained:

The highest incidence of ventral hernias is observed in the age group of 18-44 years, which is the working age, and thereby increasing the number of temporarily disabled citizens. The ratio between the comparative and the main group was almost equal, 60.86% in the comparison group, and 55.81% in the main group;

As the age group increased, the number of patients decreased, in the 45-59 age group 26% of the comparison group, and 25% in the main group;

The smallest number of patients are in the oldest age group of 75-90 years, 4.34% in the comparison group, and 7.69% in the main group (Table 2).

It is also characteristic that in most women, ventral hernias developed after traditional childbirth 6%, after Cesarean section 23%, and after injuries received in the anterior wall of the abdominal cavity 10%, after abdominal surgery 76.53.1%, of unclear etiology 8%. As can be seen from the above data, the most common etiology in the development of visceral hernias is surgical interventions in the abdominal cavity 76%, of which 23% are Cesarean section operations in women. The most infrequent etiology of the development of ventral hernias is correctly accepted traditional childbirth (Figure 2).

Descriptive data: characteristics of study participants

Table 3: The incidence of hernia by localization (DESCRIPTIVE DATA).

Location of hernias	Comparison Group		The main group	
	Abs.	%	Abs.	%
Primary hernia				
Median hernia	37	80,4	34	83
Lateral hernia	9	19,6	7	17
Primary postoperative hernia				
Median hernia	30	77	29	80,5
Lateral hernia	9	23	7	19,5
Recurrent postoperative hernia				
Median hernia	19	79,2	18	85,7
Lateral hernia	5	20,8	3	14,3
Recurrent post-prosthetic hernia				
Median hernia	4	66,7	4	66,7
Lateral hernia	2	33,3	2	33,3
Total				
Median hernia	90	72	85	81,7
Lateral hernia	25	28	19	18,3

When studying the localization of visceral hernias, it was revealed that most of them were localized along the white line of the abdomen, and were median hernias. Table 3 above shows the frequency depending on the type of hernias.

As can be seen from the above data, the main number of ventral hernias have a median location, and run along the white line of the abdomen. Only in case of recurrent post-prosthetic hernias in the main group, an equal ratio of median and lateral hernias was observed. The ratio of ventral hernia localization between the comparison group and the main group did not vary significantly (Table 3).

The table above shows the distribution of patients by the sizes of hernia. It can be noted that the hernia sizes ranged from 3 to 7 cm. The majority of patients had hernias with size 4cm and the least number of patients had hernias with size 7 cm.

Table 4: Distribution of patients by size of hernia (DESCRIPTIVE DATA).

Sizes of Hernia	Comparison Group		Main Group		Total	
	abs.	%	abs.	%	abs.	%
3 cm	24	20,9	22	21,2	46	21,0
4 cm	38	33,0	36	34,6	74	33,8
5 cm	29	25,2	23	22,1	52	23,7
6 cm	16	13,9	20	19,2	36	16,5
7 cm	8	7	3	2,9	11	5,0
Total	115	100	104	100	219	100

Table 5: Distribution of patients according to the main type of hernia surgery (OUTCOME DATA).

Type of operation	Comparison Group		Main Group		Total	
	Abs.	%	Abs.	%	Abs.	%
Onlay	86	74.7	80	76.9	166	75.7
Sublay	19	16.6	10	9.6	29	13.3
Inlay	10	8.7	14	13.5	24	11
Total	115	100	104	100	219	100

From Table 5 above, we obtained the total number of onlay, sublay and inlay abdominal hernia treatment operations. According to the table, the most commonly used type of surgical treatment of ventral hernias in both groups is onlay. The second most frequent type of surgery in both groups was sublay. The most rarely performed type of surgical treatment of ventral hernias was inlay. The onlay type of surgical treatment of anterior wall hernias was used 4.5 times more often than sublay, and 8.6 times more often than inlay in the comparison group. As for the main group, it is used 8 and 5.7 times more often, respectively.

Onlay operations for the treatment of abdominal wall hernias were performed 5.7 times more often than sublay operations, and 6.9 times more often than inlay operations (Table 5).

After studying the use of the type of surgical treatment of hernias of the anterior abdominal wall, depending on the name of the hernia (primary, postoperative, recurrent postoperative, and recurrent post-prosthetic), the following results were obtained:

As can be seen in table 6 above, the onlay method of surgical treatment of abdominal wall hernias was most often used in all types of anterior abdominal wall hernias both in the comparison group, and in the main group. This was followed by sublay intervention and then inlay as the least. Although the frequency of the use of sublay was very close to that of inlay. The inlay method was not used at all in the treatment of recurrent post-prosthetic hernias.

Risk factors affecting the outcome of surgical treatment and complications

The conducted studies allowed us to identify the following risk factors affecting the outcome of surgical treatment and complications:

problems with the formation of gray subcutaneous fat in the early postoperative period, problems with the lack of tight contact of the implant with the suture lines that are applied to eliminate hernial gates using their own tissues, problems with

Table 6: Distribution of patients by type of hernia treatment in primary and recurrent forms (OUTCOME DATA).

Intervention	Comparison Group		Main Group	
	Abs.	%	Abs.	%
For primary hernias				
Onlay	35	76,1	34	83
Sublay	8	17.3	4	9,7
Inlay	3	6.6	3	7,3
Total	46	100	41	100
In case of recurrent postoperative hernias				
Onlay	29	74.4	26	72.2
Sublay	6	15.3	4	11.1
Inlay	4	10.3	6	16.7
Total	39	100	36	100
In case of recurrent postoperative hernias				
Onlay	17	70,8	14	66,7
Sublay	4	16.7	2	9.5
Inlay	3	12.5	5	23.8
Total	24	100	21	100
In case of recurrent post-prosthetic hernias				
Onlay	5	83.3	0	100
Sublay	1	16.7	0	0
Inlay	0	0	0	0
Total	6	100	0	100

insufficient strengthening of the anterior abdominal wall where the risk of paraprosthetic hernia formation is high, the problem of the occurrence of extensive subcutaneous spaces in the early postoperative period with lateral giant hernias, problems of not carrying out local therapeutic manipulations to prevent the formation of seromas and anti-inflammatory actions, difficulties with the absolute immobilization of the implant with subcutaneous fat.

These factors, combined with the results of the study of humoral bioregulators in the blood, made it possible to optimize the indications and methods of performing allohernioplasty of the anterior abdominal wall. **(MAIN RESULTS:** (c) consider translating estimates of relative risk into absolute risk for a meaningful time period)

Method of allohernioplasty of the anterior abdominal wall

Taking into account the data obtained, we used the following method of allohernioplasty of the anterior abdominal wall. The method is performed as follows.

The first stage

Hernia excision (for example, hernias with dimensions 7*5*3), after excision of the hernia, the edges of the fascia and aponeurosis of the natural site of recurrence –the emergence of a paraprosthetic / repeated hernia are stitched with a monopolypropylene thread with blue color HR-35, continuous suture (Figure 3).

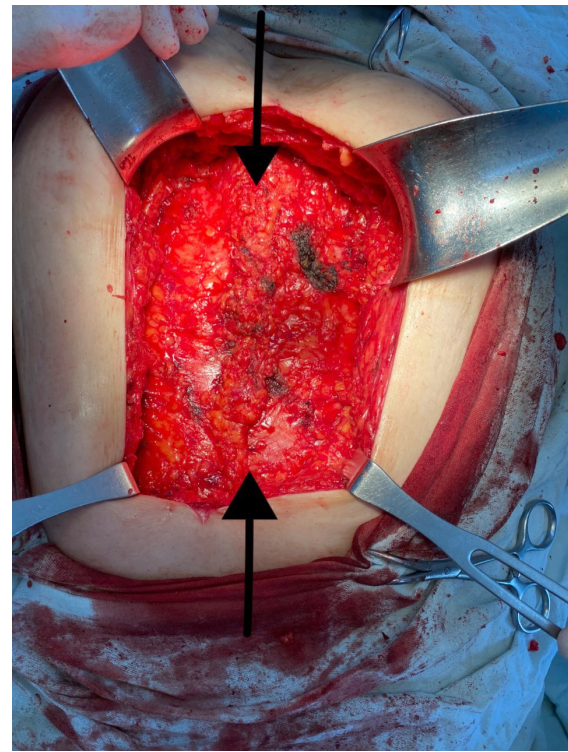


Figure 3: Stitching of fascia edges and aponeurosis of the natural site of recurrence.

The second stage

The dimensions of the hernia incision are measured with a sterile ruler: width and length. With scissors, 2 mesh implants of the required size are cut out, a mesh implant made of polypropylene is used (Figure 4).

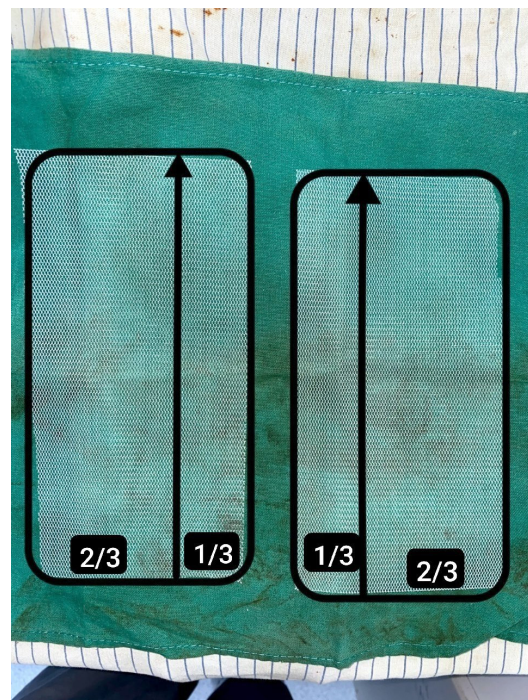


Figure 4: 2 mesh implants are cut out with scissors

The edges of the mesh implant are smoothed with scissors. The length of the mesh implant exceeds the length of the suture of the site of natural recurrence by 1-1.5 cm at each end. The minimum width of the mesh implant is 6 cm. The minimum distance from the edge of the natural site of recurrence is 4 cm, the remaining 2 cm go to the opposite side from the seam of the natural site of recurrence.

The third stage

The first mesh implant is placed on the left side, at a minimum distance from the edge of the natural site of recurrence (for example, it is 4 cm, that is, 2/3, the remaining 2 cm, that is, 1/3, goes to the opposite side from the seam of the natural site of recurrence. First, a continuous suture is performed along the distal edge of the mesh implant, retreating 0.3-0.5 cm from the edge of the mesh. A weak tension of the mesh implant is performed, for an even distribution of tension under load, and after that a second continuous suture is performed in the middle of 2/3 of the mesh implant, about 2 cm from the seam of the natural site of recurrence, for additional durability and redistribution of tension-tension equally in the aponeurosis and in the mesh implant. The next suture (continuous suture) is performed from the proximal edge of the mesh implant, which is 1/3 of the mesh (mesh implant), retreating 0.5 cm from the edge of the mesh (mesh implant) (Figure 5). The second mesh implant is placed on the right side, while the minimum distance from the edge of the natural site of recurrence is 4 cm, that is, 2/3, the remaining 2 cm, that is, 1/3, goes to the opposite side from the seam of the natural site of recurrence (Figure 6). First, a continuous suture is performed along the distal edge of the mesh implant, retreating by 0.3-0.5 cm from the edge of the grid. A weak tension of the mesh implant is carried out, for an even distribution of tension under load, and after a second one is carried out.

Continuous suture is performed in the middle of 2/3 of the mesh implant, approximately 2 cm from the seam of the natural site of recurrence, for additional durability and redistribution of tension-tension equally in the aponeurosis and in the area of the mesh implant. Next, a continuous suture is performed from the proximal edge of the mesh implant, which is 1/3 of the mesh (mesh implant), retreating 0.5 cm from the edge of the mesh (mesh implant).

And after that, a two-layer mesh cover of a polypropylene implant is formed in the zone of natural recurrence (Figure 7).

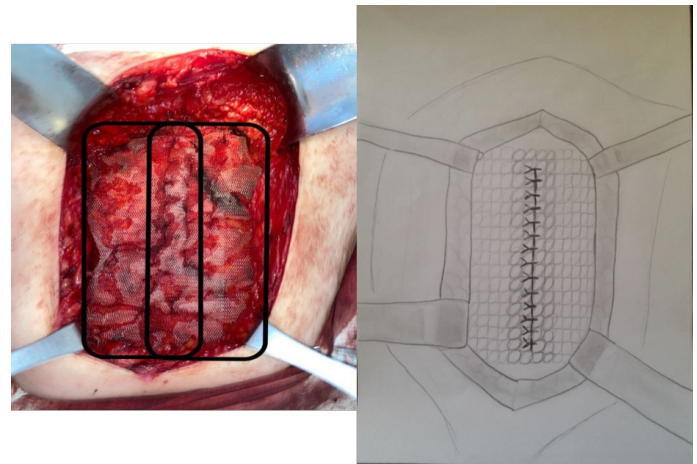


Figure 7: Both mesh implants are inserted.

The fourth stage

It consists of conducting a U-shaped seam in the area of a two-layer mesh cover (duplication of a polypropylene implant), with the inclusion of aponeurosis in the seam, with a distance of 0.5 cm between each U-shaped seam. Thus, in the place of a natural relapse, they are formed: one continuous suture between the aponeuroses; two continuous sutures with a double-layer mesh implant, for uniform distribution of tension-tension equally in the aponeurosis in the area of the mesh implant; and a U-shaped seam with the connection of both sides of the aponeurosis and 2 layers of the mesh implant, which forms a uniform distribution of tension-tension and a stable strong connection at the natural site of recurrence, giving no chance for recurrence (Figure 8).

The fifth stage

The establishment of two drains, one on the left, the second on the right side of the incision site, to improve the outflow of seroma from the wound and further increase healing. Fixing drains (Figure 9).

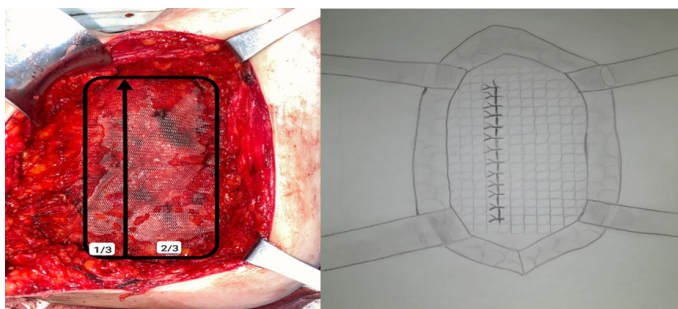


Figure 5: The first mesh implant is placed on the left side.

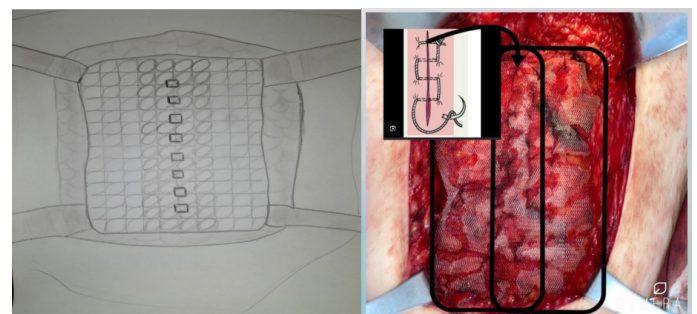


Figure 8: Conducting a U-shaped seam in the area of a two-layer mesh cover.

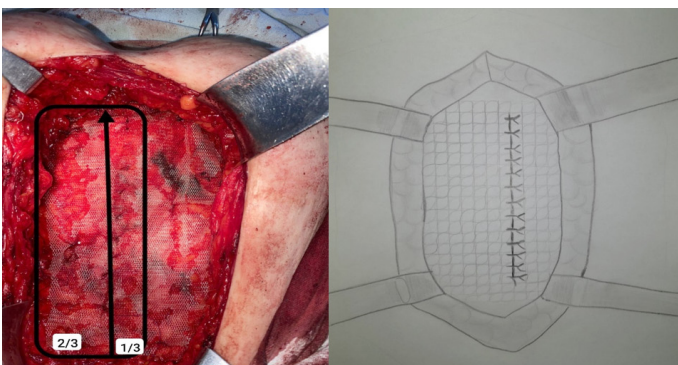


Figure 6: The second mesh implant is placed on the right side.



Figure 9: The establishment of two drainage systems along the Redon A method of allogernoplasty in the surgical treatment of ventral hernias.

The sixth stage

Stitching of subcutaneous adipose tissue with vicryl threads. Stitching of the skin, depending on the size of the excision, a cosmetic or intermittent suture with a vicryl thread is used.

The formula of the new surgical method of allohernioplasty.

This method includes: Mid-median laparotomy with hernial sac extraction, opening of the hernial sac, preparation of the field for allohernioplasty, determination of the size of the hernial gate, cutting out a polypropylene mesh, fixing the specified mesh to the edges of the hernial gate, drainage and layered suturing, characterized in that two layers of mesh/mesh are used as an implant with the formation of a duplication, for this 2/3 of the first mesh layer from the seam of the natural site of recurrence is fixed to the left edge of the aponeurosis, and 1/3 of the first mesh layer of the seam of the natural site of recurrence is fixed to the right edge of the aponeurosis, 1/3 of the second mesh layer from the seam of the natural site of recurrence is fixed to the left edge of the aponeurosis, and 2/3 of the second mesh layer from the seam of the natural site of recurrence is fixed to the right edge of the aponeurosis with the formation of uniform tension, while the distal edges of the mesh are fixed to the edges of the aponeurosis continuous with a seam, retreating 0.3-0.5 cm from the edge of the mesh, then the first layer of the mesh is sewn with the second layer in the form of a duplication at the site of natural recurrence in a continuous - a shaped seam, with the inclusion of aponeurosis in the seam, with a distance between the seams equal to 0.5.

The advantage of the claimed method is

A) Our method uses a two-row grid in the form of a duplicate, with the attachment of 2/3 of each grid to the left side and the other to the right side of the edge of the aponeurosis, with the formation of uniform tension-tension, due to the interconnection of a large area of aponeurosis on each side and their connection by a mesh duplication on the met of natural recurrence and transition 1/3 of each the mesh is placed on the opposite side, followed by stitching with a continuous seam.

B) With a direct U-shaped seam, we strengthened the mesh duplication directly into the seam, which was closed on the abdominal cavity, which hermetically and tightly closes, stably preserves the site of the incision for a natural recurrence.

Thus, the proposed method, combined with optimized indications for performing allohernioplasty, is characterized by novelty and reliable plasty of the anterior abdominal wall. A patent was obtained for this method (Patent for invention No. IAP 07415, 05/24/2023) for an invention to the Intellectual Property Agency of the Republic of Uzbekistan ("The method of allohernioplasty in the surgical treatment of ventral hernias »).

In addition, the development of fibrosis at the site of the endoprosthesis leads to deformation or wrinkling. Wrinkling is a process that really exists; this occurs when there is an overgrowth of coarse fibrous connective tissue, which causes the allograft to shift from the place of strengthening and lead to wrinkling. The duplicate method of plastic surgery is opposed to the rough expansion of fibrous connective tissue in terms of mixing and wrinkling of the implant, since the mechanical frame is stronger than in the conventional method.

Table 7: Distribution of patients by type of hernia treatment in primary and recurrent forms (OUTCOME DATA).

№	Method	Onlay	Sublay	Inlay	Total
1.	A new method	80	0	0	80
2.	Other Methods	0	10	14	24
	Total	80	10	14	104

In this study we presented the new method using only the onlay position. Therefore, comparison between the main group and comparison groups was focused more on the onlay positions.

Of the 104 patients in the main group, 80 (76.9%) were onlay patients, sublay-10 (9.6%) patients, and inlay positions-14 (13.5%) patients (Table 6).

Of the main group, 80 (76.9%) patients had a new surgical method for which an invention patent was obtained. All 80 patients were operated on using the onlay method. While the other 24 patients of the sublay (10) and inlay (14) positions were operated upon with other methods. This can be seen in table 7 above.

Outcome data

After studying patients in a comparative group, and finding several key causes of abdominal hernia recurrence, at the site of natural recurrence, the method of surgery was changed, measures were taken to improve and accelerate postoperative rehabilitation, aimed at reducing early and late postoperative complications. After that, a detailed study of the patients of the main group was conducted in order to assess the degree of improvement of positive results after the changes we made in the operation and postoperative rehabilitation of patients with hernias of the anterior abdominal wall. The main study group consisted of 104 patients, among whom allohernioplasty surgery was performed on 80 of them according to the new method.

By conducting a comparative assessment between the comparison group and the main group, a significant improvement in the outcome of allohernioplasty in patients of the main group was proved.

The following positive results were obtained with the use of a new method of allohernioplasty for anterior abdominal wall hernias and a complex of postoperative therapy and rehabilitation developed by us.

The results of the distribution of the operation position between the groups were close to each other. Allohernioplasty in the on-lay position is the most frequent method, and it was performed in 75.7% of cases, of which 86/51.8% were patients in the comparison group, and the remaining 80/48.2% ($\chi^2=9.692857143$; Df=2; significantly $p<0.007$) (Table 8).

Table 8: Distribution of patients by type of hernia treatment in primary and recurrent forms (OUTCOME DATA).

Type of operation	Comparison Group		Main		Total	
	Abs.	%	Abs.	%	Abs.	%
Onlay	86	74.7	80	76.9	166	75.7
Sublay	19	16.6	10	9.6	29	13.3
Inlay	10	8.7	14	13.5	24	11
Total	115	100	104	100	219	100
Criteria χ^2	$\chi^2=9.692857143$; Df=2; reliable $p<0,007$					

With the onlay position, which is the most commonly used among patients in the main groups, 166 / 75.7% of patients had the lowest incidence of postoperative complications, which had a significant advantage in this aspect in patients of the main group. Comparing each type of postoperative complications between groups with the on-lay position of allohernioplasty, one can see a clear positive trend in patients of the main group. In detail, bleeding was observed in 3.4% of patients in the comparison group, which is 2.61 times more common than in patients of the main group (in 1.3% of patients). Accumulation of seromas in the formed cavity of the anterior abdominal wall was observed in 10% of patients in the main group, which is 2.09 times less common than in patients of the comparison group (20.9%). The accumulation of infiltrate in the formed cavity was observed in 1.3% of patients in the main group, which is 1.9 times less common than in patients of the comparative group. The development of the process of suppuration of the surgical wound was observed in 2.6% of patients in the main group, which is 1.76 times less frequent than in the comparison group. Postoperative pleura-pulmonal complications were observed in both groups with the same frequency (2.4% of patients). No fatal outcome was observed in both groups at the onlay position. There were also no acute cardiovascular insufficiency in both groups. Overall, postoperative complications occurred in 17.5% of patients in the main group, which is 1.92 times less common than in the comparison group (33.7%) ($\chi^2=19.5$; Df= 6; significantly $p<0.003$);

Table 9: The frequency of early complications after various techniques.

Complications	Onlay		Sublay		Inlay		Total	
	Abs.	%	Abs.	%	abs.	%	Abs.	%
Comparison Group								
Bleeding (hematoma)	3	3.4	-	-	-	-	3	2.6
Gray	18	20.9	2	10.5	2	20	22	19.1
Infiltration	2	2.3	3	15.7	1	10	6	5.2
Suppuration	4	4.6	2	10.5	1	10	7	6.1
Pleuropulmonary	2	2.3	2	10.5	1	10	5	4.3
OSS	0	0	1	5.2	1	10	2	1.7
Lethality	0	0	1	5.2	0	0	1	0.9
Patients with complications	29	33.7	11	57.9	6	60	46	40
Patients without complications	57	66.3	8	42.1	4	40	69	60
The main group								
Bleeding (hematoma)	1	1.3	-	-	-	-	1	0.9
Gray	8	10	1	10	1	7.1	10	9.6
Infiltration	1	1.3	1	10	-	-	2	1.9
Suppuration	2	2.6	1	10	1	7.1	4	3.8
Pleuropulmonary	2	2.5	1	10	1	7.1	4	3.8
OSS	0	0	1	10	1	7.1	2	1.9
Lethality	-	-	-	-	-	-	-	-
Patients with complications	14	17.5	5	50	4	28.5	23	22.1
Patients without complications	66	82.5	5	50	10	71.5	81	77.9
Criterion χ^2	$\chi^2=28,9$; Df=6; $p<0,05$							

Outcome data

The number of patients followed up in the long-term period in the comparison group was 104 patients that were operated on out of 115 patients, and in the main group 84 patients that were operated on out of 104 patients. As for the patients of the main group, the number of patients operated on in on lay does not vary much compared to the comparison group, which helps to make the results of their ratio as fair as possible. ($\chi^2=13.95567616$; Df=2; significantly $p<0.05$) (Figure 10).

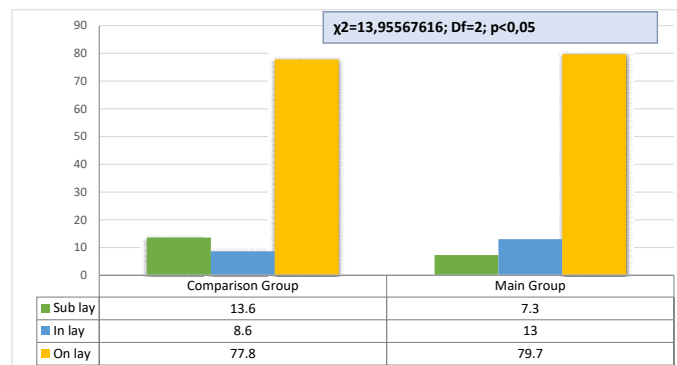


Figure 10: Distribution of patients tracked in the long term.

The distribution of patients into groups was carried out depending on the period of follow-up, after allohernioplasty of the anterior abdominal wall. The follow-up period ranged from 1 year to 3 years or more.

Up to 1 year, 188 patients were under observation, of which 104/90.4% (of the initial number of patients) were in the comparison group, and the remaining 84 patients in the main group. From 1 to 2 years, 164 patients were monitored, of which 91/79.1% of patients were in the comparison group, and the remaining 73/70.1% in the main group. From 2 years to 3 years, 114 patients were monitored, of which 66/57.3% of patients were in the comparison group, and the remaining 48/46.1% in the main group.

84 patients with follow up period of 3 years or more were under observation, which is 38.2% of all the studied patients. And 43/37.2 of them were in the comparison group, the remaining 41/39.4 in the main group. For 3 years or more, the range of patients studied narrowed from 100% to 38.3% ($\chi^2=16.0478219$; Df=3; significantly $p<0.05$) (Table 10).

Outcome data

Table 10: The frequency of diagnosed late complications.

Terms of observation	Comparison Group		The main group		Total	
	Abs.	%	Abs.	%	Abs.	%
Up to 1 year	104	90.4	84	80.7	188	85.8
1-2 years old	91	79.1	73	70.1	164	74.8
2-3 years	66	57.3	48	46.1	114	52.1
3 years or more	43	37.3	41	39.4	84	38.3
Criterion χ^2	$\chi^2=16,0478219$; Df=3; reliable $p<0,05$					

Overall, 39 late postoperative complications were detected during the entire follow-up period, after allohernioplasty of the anterior abdominal wall, 30/77% of which were in the comparison group, and the remaining 9/23% in the main group (Table 11). Between the groups: $-2=50.5$; Df=3; significantly $p< 0.05$ (Table 10).

The incidence of late postoperative complications after allohernioplasty of the anterior abdominal wall had a strong variation between groups, with the distribution of patients depending on the position of allohernioplasty.

With the on lay position, 22/25.9% of cases of various late complications were detected. Upon detailed analysis, the following results were obtained:

Implant wrinkling occurred in 5 patients, 4 / 4.6% of whom were in the comparison group, and only 1 / 1.2% of patients were in the main group, which is 3.8 times less common than in the comparison group;

The development of a cutaneous prosthetic fistula occurred in 9 patients, 7/8.2% of them were in the comparison group, and only 2 / 2.5% in the main group, which is 3.28 times less common than in the comparison group. The development of a cutaneous prosthetic fistula is the most common late complication after allohernioplasty of the anterior abdominal wall in the on lay position;

Recurrent post-prosthetic hernia occurs in 6 patients, and all of them are in the comparison group, in the main group, the development of recurrent post-prosthetic hernias was not observed;

Dormant occluded infiltrate was found in only 1 / 1.2% of patients in the main group;

Table 11: The frequency of diagnosed late complications.

Terms of observation	Comparison group		Main group	
	Abs	%	Abs.	%
Up to 1 year	8	6.9	2	1.9
1-2 years	9	7.8	3	2.8
2-3 years old	6	5.2	2	1.9
3 years or more	7	6.1	2	1.9
Total	30	26.1	9	8.6
Without complications	85	73.9	95	91.3
Criterion χ^2	$\chi^2 = 50,5; Df=3; \text{reliable } p < 0,05$			

As for the development of dormant occluded abscess, the opposite is true here, it was observed only in 1 / 1.2% of the patient in the comparison group ($\chi^2=22.5; Df=4; \text{significantly } p<0.05$).

In the sub lay position, 10 / 39.8% of cases of various late complications were detected. Upon detailed analysis, the following results were obtained:

Implant wrinkling occurred in 3 patients, 2/10.5% of whom were in the comparison group, and only 1/10% of patients were in the main group, which is 2 times less common than in the comparison group;

The development of a cutaneous prosthetic fistula was found in only 1 patient from the comparison group;

Recurrent post-prosthetic hernia does not occur in any patient;

Dormant occluded infiltrate was found in only 3 patients 2 / 10.5% of whom were in the comparison group;

As for the development of dormant occluded abscess, the

same story is here, it was observed only in 3 patients, 2 of whom were in the comparison group.

The highest incidence of late postoperative complications after allohernioplasty of the anterior abdominal wall was observed in patients operated in the sub lay position (39.8%) ($\chi^2=8.333333; Df=4; \text{unreliable } p>0.05$).

In the in lay position, 7 cases of various late complications were identified. Upon detailed analysis, the following results were obtained:

Implant wrinkling occurred in one 1/10% of the patients in the comparison group;

The development of a cutaneous prosthetic fistula was not found in any patient;

Recurrent post-prosthetic hernia does not occur in any patient;

Dormant occluded infiltration was found in only 3 patients, 2/20% of whom were in the comparison group, and only 1/7.1% in the main group, which is 2.8 times less common than in the comparison group;

As for the development of dormant occluded abscess, the same story is here, it was observed only in 3 patients, 2 of whom were in the comparison group ($\chi^2=2; Df=4; \text{significantly } p<0.735758882$) (Table 10). Between the groups: $\chi^2=35.3333333; Df=4; p<0.05$ is significant (Figure 11, Figure 12).

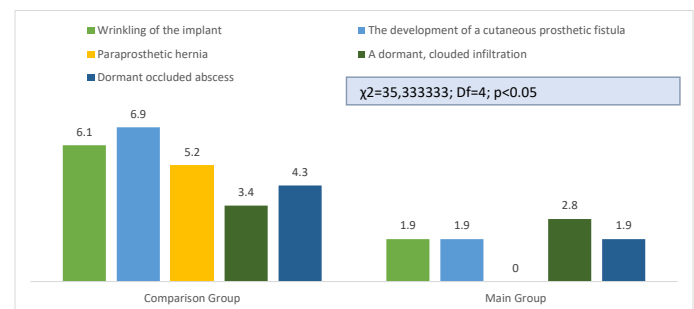


Figure 11: The frequency of late complications between the two groups.

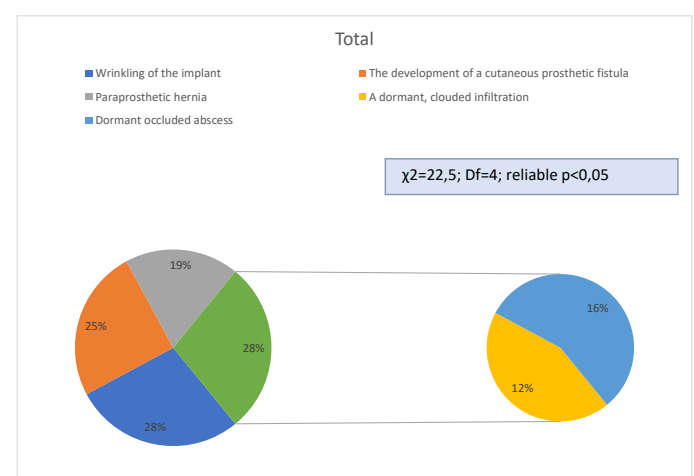


Figure 12: The incidence of all late postoperative complications after allohernioplasty

All postoperative complications after anterior abdominal wall allohernioplasty were divided into two 2 groups: early and late complications. Early postoperative complications occurred, only 56/25.5% of patients (out of 219 patients), of which 38/33.04% of patients were in the comparison group, and only 18/17.3% were in the main group, which is 1.9 times less common than in the comparison group ($\chi^2=22.222222$; Df=1; reliably $p<0.05$).

Main results: B

Late postoperative complications developed in 39 / 17.8% of patients (out of 219 patients), of which 30 / 26.08% were in the comparison group, and only 9 / 8.6% of patients in the main group, which is 3 times less frequent than in the comparison group ($\chi^2=49$; Df=1; significantly $p<0.05$).

In total, 95/43.3% of the cases of early and late postoperative complications after allohernioplasty of the anterior abdominal wall were recorded. Of these, 68/59.1% were in the comparison group, only 27/25.9% in the main group, which is 2.28 times less frequent than in the comparison group ($\chi^2=62.25925926$; Df=1; significantly $p<0.05$).

Of the 166 patients studied, 80/48.2% were in the main group, and the remaining 86/51.8% were in the comparison group. Our new method of anterior abdominal wall allohernioplasty was used in 80 patients from the main group;

Such a complication as implant wrinkling was detected in 5 patients (out of 166 patients), 4 / 80% of them were in the comparison group, and the remaining 1 / 20% of patients were in the main group, but without the use of the new method of anterior abdominal wall allohernioplasty developed by us. The wrinkling of the implant was not observed in patients of the main group who had a new method of allohernioplasty,

The formation of a cutaneous prosthetic fistula was observed in 9 patients (out of 166), 7 of them were in the comparison group, 1 patient was in the main group, but the new method of allohernioplasty of the anterior abdominal wall developed by us was not used on this patient. The formation of a cutaneous prosthetic fistula was observed in 2.1% of patients in the main group who had a new allohernioplasty method, which was 3.85 times less common than in the comparison group and 1.47 times less common than patients in the main group who were not treated with the new method. The formation of a cutaneous prosthetic fistula is the most common late complication after allohernioplasty of the anterior abdominal wall (in 9 out of 166 patients).

Main results

Discussion

The development of recurrent post-prosthetic hernia was observed in 6 patients, and all of them were in the comparison group. In the patients of the main group, the development of recurrent post-prosthetic hernia was not observed at all.

As for the formation of a dormant occluded infiltrate, the picture is completely different; it was detected only in one patient in the main group who did not receive the new method of treatment we developed. This type of late postoperative complication was not detected in patients of the main group who were operated on using our new method in the onlay position.

Dormant occluded abscess developed in only 1 patient in the comparison group. In the patients of the main group, the devel-

opment of a dormant occluded abscess in the operating cavity was not observed at all (Figure 13 and 14). Between the groups: $\chi^2=14.39286$; Df=4; significantly $p<0.05$.

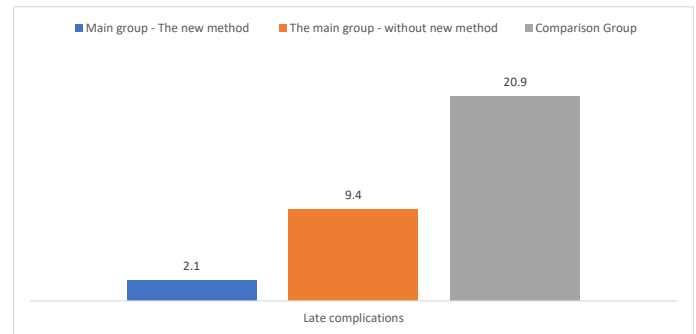


Figure 13: The incidence of late postoperative complications depending on the method of surgery.

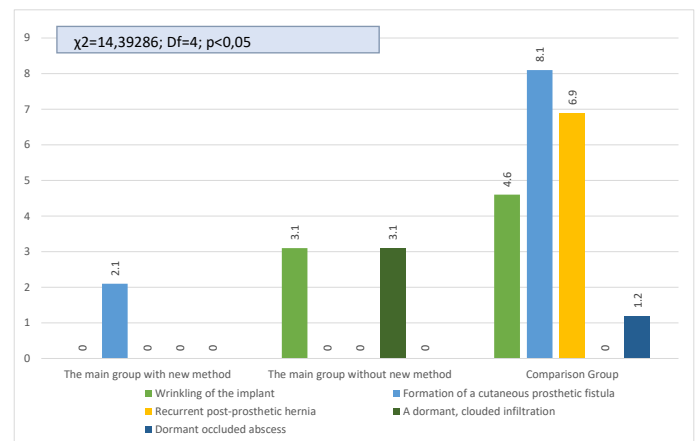


Figure 14: The incidence of late complications depending on the application of the new method.

Key results

Limitation of the study

A limitation of this study is that the new surgical method introduced was only presented and analyzed for the onlay position. Further study is needed to show its possibility and effectiveness for the sublay and inlay positions. **Limitations**

Compliance with ethical standards

There are no conflicts of interests.

According to the Ministry of Health of Uzbekistan, for this research, informed consents were provided.

Conclusion

Performing allohernioplasty using a new technique reduced the likelihood of complications from the formed cavity from 28.1% to 6.2%, in the structure of which 8.7% of cases were conservatively resolved in the comparison group, unlike 6.6% of cases in the main group, 23.4% of patients in the comparison group. Repeated minimally invasive interventions were required, in the main group, this indicator was 12.5% ($\chi^2=6,164$; df=2; significantly $p<0.05$).

Recurrence after allohernioplasty, in particular paraprosthetic hernias, mainly comes from the primary site of herniation of the anterior abdominal wall and in our study this Figure was 5.2% in the comparison group, and 5.8% in the main group. The proposed method, which uses a two-row mesh in the form of a

duplicate, with the formation of uniform tension-tension, due to the interconnection of a large area of aponeurosis on each side and connecting them with a duplicate mesh at the site of natural recurrence, reliably strengthens the primary defect of the abdominal wall and reduces the risk of paraprostatic hernia formation from 5.2% to 0%.

A comparative analysis of clinical studies showed that the use of the proposed tactical and technical recommendations for prosthetic plastic surgery for ventral hernias reduced the incidence of wound complications from 33.1% to 17.3% (significantly $p < 0.001$), including the formation of clinically significant seromas from 19.1% to 9.6% (significantly $p < 0.05$), and shortened the duration of drainage for more than 7 days from 27.8% to 11.4% (significantly $p < 0.05$).

The introduction of an improved technique of prosthetic plastic surgery for ventral hernia, combined with the use of the proposed option for preventing the development of wound complications, reduced the incidence of long-term complications from 26.1% to 8.6% (significantly $p < 0.005$), including wrinkling of the prosthesis from 6.1% to 1.9%, the formation of cutaneous prosthetic fistulas from 6.96% to 1.9%, dormant infectious complications from 7.7% to 4.7% and the formation of a paraprostatic hernia from 5.2% to 0% (significantly $p < 0.05$).

Interpretation of results

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