How to Cite:
Omarov, N. B., Kazangapov, R. S., Imangazinov, S. B., Kairkhanov, E. K., Abdrakhmanov, S. T., & Auenov, M. A. (2022). Hernioplasty technique in wound complications prevention. *International Journal of Health Sciences*, *6*(S7), 3101–3117. https://doi.org/10.53730/ijhs.v6nS7.12116

Hernioplasty technique in wound complications prevention

Omarov N. B.
Nazarbek Omarov (MD PhD, surgeon of the highest category, Associate Professor), 103, Abay Kunanbayev St., 071400, Semey, East Kazakhstan area, Republic of the Kazakhstan
https://orcid.org/0000-0003-3262-1410
Corresponding author email: omarov_nazarbek@rambler.ru

Kazangapov R. S.
https://orcid.org/0000-0003-1513-7432

Imangazinov S. B.
https://orcid.org/0000-0002-8236-6246

Kairkhanov E K.
https://orcid.org/0000-0001-7289-3272

Abdrakhmanov S. T.
https://orcid.org/0000-0002-4270-3498

Auenov M. A.
https://orcid.org/0000-0002-1809-9091

Abstract---Background: The issues of prevention of wound complications in the surgical treatment of postoperative ventral hernias (POVG) remain relevant due to the increase in the number of surgical interventions on the abdominal organs and the development of postoperative ventral hernias in the aftermath. Despite the large number of proposed hernioplasty techniques for postoperative ventral hernias, the rates of wound complications remain high. The use of synthetic materials did not provide a reduction in the amount of infection in the area of surgical intervention. In this connection, the improvement of surgical treatment of patients with postoperative ventral hernias, aimed at the prevention of wound complications, is becoming even more relevant. Wound complications prevention in the surgical treatment of postoperative ventral hernias remains relevant due to the increase in the number of operative abdominal interventions. Therefore, improving surgical rehabilitation of patients in the postoperative period in order to minimize wound complications

Manuscript submitted: 9 April 2022, Manuscript revised: 18 June 2022, Accepted for publication: 27 July 2022

acquires special practical importance. The main aim was the research of clinical effectiveness of use of autodermogernioplasty to reduce the incidence of wound postoperative complications in patients with postoperative ventral hernias. Materials and Methods: Performed controlled prospective parallel randomized trial involving the participation of 161patients aged from 20 to 75 (median 55±2.6 years). 41 (25.5%) patients were participants of the basic follow-up group and were treated using hernial gate autodermaplasty method. In the 1st group of comparison were 41 patients operated according to the Onlay method. 40 patients were participants of the second group, which were operated on according to the Sublay method. 39 persons were in the 3rd group of comparison and were operated according to the Inlay method. Results and Conclusions: After performed herniotomy in 31 (19.3%) cases, wound complications were observed: the formation of gray wounds, infiltrate postoperative wounds, suppression and the formation of haematoma of the postoperative wound. Autodermaplasty of postoperative ventral hernias reduced incidence of wound complications from 31.7% to 4.9% ($p<0.05$). As a result, has been reduced the length of inpatient treatment from 11.0±0.12 to 8.3±0.1 days ($p<0.001$). And the proportion of good and satisfactory results of postoperative ventral hernias surgical treatment has been improved to 96.8%.

***Keywords*---**postoperative ventral hernias, hernioplasty, wound complications, autodermaplasty.

Introduction

Currently, there is an increasing interest concerning matters of surgical treatment of postoperative ventral hernias due to the increase in the number and complexity of operations on the organs of abdomen, pelvis and retroperitoneal fiber. The occurrence of wound complications does not decrease, and as a result, the number of hernia recurrences [1-7]. In the case of removing of postoperative ventral hernias, it was proposed to introduce biologically inert materials into practice to reduce the load on the edges of the sutured hernial defect. Having sufficient strength and porosity necessary for germination with connective tissue, they began to be widely used in herniology. In the future, their negative properties were also revealed. Significant proportion of their rejection, suppression, fistula formation and, as a result, high frequency of hernia recurrences were noted [8, 9]. With this aim, synthetic endoprostheses have begun to be used, which made it possible to carry out non-tension types of hernioplasty. Use of unstretched hernioplatics was also aimed at the prevention of wound complications [10, 11]. However, even here there were difficulties, controversial and demanding new issues. So, the topic of principled approach to allogernioplasty as a whole is discussed. In particular, in which layers of the abdominal wall and how should explants be strengthened? So, the endoprosthesis technique is widespread, which provides for the strong fixation of the implant over the sutured hernioplasty (Onlay hernioplasty method) or the location of the implant retromuscularly in the thickness of the abdominal wall (Sublay hernioplasty method), there is the third

type of endoprosthesis to the edges of hernia defect along the perimeter (Inlay hernioplasoplasty method). However, wound complications after allogernioplasty still occur in 35.7-89.5% of cases, including in the form of seroma from 31.4% to 52.6%, hematomas from 7.1% to 28.74% depending on the method of surgical treatment [12].

Laparoscopic surgery has opened new possibilities in the treatment of patients with postoperative hernias, in terms of preventing wound complications. Use of endovideotechnics for herniotomy was encouraging about the reduction of wound complications [13-16].

However, it is not yet possible to completely solve the problem. Clear algorithms to ensure comprehensive approach in the prevention of wound complications in hernia have not yet been developed. The diversity of individual preventive measures shows absence of unified systemic approach and indicates the unresolved problem [17, 18].

In this regard, improvement of surgical rehabilitation of patients with postoperative ventral hernias (POVH) aimed at prevention of wound complications acquires even more significant practical value [19-21].

The aim of research was to research of clinical effectiveness of using autodermagernioplasty to reduce the incidence of wound postoperative complications in patients with POVH.

Materials and methods

The research design is based on controlled prospective randomized parallel clinical trial. The main group (41 persons – 25.5% of operated patients) were patients operated with use of postoperative ventral hernias of autodermaplasty technique in hernioplasty according to our methodology. In the same time, gender distribution was: men - 14 people (34.1%), women- 27 (65.9%). The Ethical Comity of the Non-Profit Joint-Stock Company “Medical University of Semey” has considered and approved by protocol 11 from 27.09.2017 the research has complied with the principles of the Helsinki Declaration.

The study design is based on a controlled clinical trial. The criteria for inclusion of patients in the study were:

1. Patients aged 20 to 75 years.

2. Postoperative ventral hernias - W2, W3, W4 hernias.

3. Planned surgical intervention.

4. Hernioplasty using the developed methods of local prevention of postoperative wound complications and the technique of autodermoplasty of hernial gates and synthetic polypropylene mesh.

5. Class of surgical and anesthetic risk I-III according to ASA.
The criteria for excluding patients for the study were:

1. Postoperative ventral hernias - W1.

2. Surgical interventions on abdominal organs for emergency and urgent indications.

3. Recurrent POVG.

4. Operational and anesthetic risk class IV and V according to ASA.

During surgery, skin flap bearing postoperative scar was dissected with two elipsoid incisions corresponding to the size of hernia. Preparation of auto skin for for autodermal hernial gate plastics in postoperative ventral hernias was carried out according to Yanov (Fig. 1a) with scalding with 0.98% solution of NaCl 0.98% (t= 90-98˚C, exposure - 1-2 min) [22]. Then skin epidermis was de-epithelialized with scalpel (Fig. 1b) and excision of subcutaneous tissue of autodermotransplant with scissors (Fig. 1c). Transplant was temporarily immersed in furacillin solution.

Preparation of the autoflesh for autodermal hernial gate plasty in postoperative ventral hernias was carried out according to Yanov (Figure 1) with scalding with a saline solution of sodium chloride at a temperature of 90-980 C for 1-2 minutes [22]. Then the skin epidermis was deepithelized with a scalpel (Figure 2) and the subcutaneous tissue of the autodermograft was excised with scissors (Figure 3). The graft was temporarily immersed in a solution of furacillin.

Figure 1 - Treatment of a skin flap fixed along the perimeter with clamps with a hot saline solution of sodium chloride

Hernia sac was opened and existing adhesions were separated. Then, the de-epithelized autodermal flap was sutured with U-shaped non-through sutures to the inner edge of the peritoneal-muscular-aponeurotic layer with dermal surface, facing free abdominal cavity (Fig. 2).

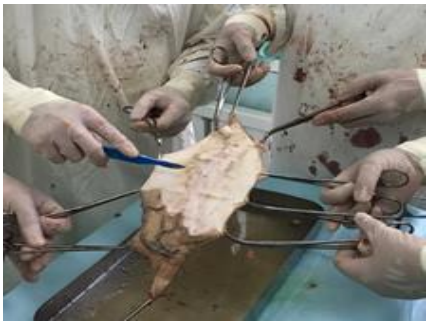

Figure 2 – Deepithelization of the epidermis of the skin flap with a scalpel

Scheme of the final type of hernial gate suturing by the developed method of autodermaplasty of postoperative ventral hernias is shown in figure 3.

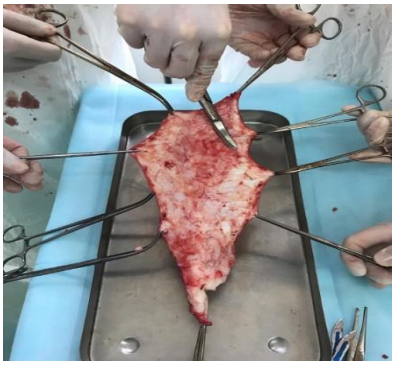

Figure 3 – The moment of excision of the subcutaneous tissue of the autodermotransplant with curved scissors

The hernial sac was opened and the existing adhesions were separated. Then the de-epithelized autodermal flap was sewn with U-shaped through seams to the inner edge of the peritoneal-muscular-aponeurotic layer with a dermal surface facing the free abdominal cavity (Figure 4).

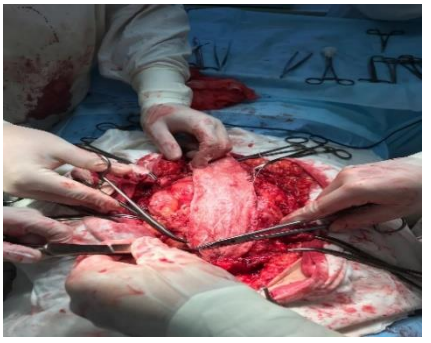

Figure 4 - The moment of the beginning of the suturing of the autoderm to the edge of the muscular-aponeurotic layer of the hernial gate

The scheme of the final type of hernial gate suturing by the developed method of autodermoplasty of postoperative ventral hernias is shown in Figure 5.

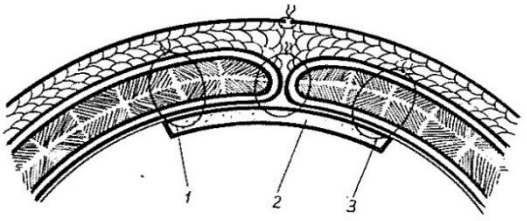

Figure 5 - Hernia gate suturing scheme:

1, 3 – non-through lateral U-shaped sutures of muscle-aponeurotic layers

2 – autodermal deepithelized flap

In the comparison groups, patients were recruited on the stratified basis, that is, from the location of polypropylene endoprosthesis in the thickness of abdominal walls. In the 1st group were 41 patients operated according to the onlay method, when endoprosthesis was placed over the sutured edges of hernial gate.

In the 2nd group of comparison were ill people (40 ill people), operated according to sublay method - endoprosthesis was placed over the sutured edges of hernial gate and in the 3rd group of comparison were ill people (39 ill people), operated according to the inlay method - endoprosthesis was sewn to the edges of hernial gate around the perimeter.

Formation of observation groups

The sample size was calculated using PASS 2000, version 12.0.4. To determine the required sample size, calculation formula was used during comparing two frequencies (1) [23].

$$n = \frac{(A+B)^2 \times (p_1 \times (100-p_1) + p_2 \times (100-p_2))}{(p_1-p_2)^2} \quad (1)$$

The significance level was taken equal to 0.05; the research power – 90%, expected frequency values in the main group – 30%, in the comparison group – 60%, number of the whole population – 560821. On the basis of calculation was obtained the value of the required number in each group not less than 22 cases.

Principles of patient group formation in the research

Development of postoperative ventral hernias was preceded by surgical access to abdomen in the past by way of medial laparotomy in 49 (30.4%) ill people, for 42 (26.1%) people were performed “lateral” laparotomy in cases of in appendectomy

and cholecystectomy, 41 (25.5%) - had lower-medial laparotomy and in 29 (18%) - had upper-medial laparotomy.

The following patient inclusion criteria were used in the formation of study groups:

1. The age of patients from 20 to 75 years old.
2. Medium and large postoperative ventral hernias - W2, W3, W4 hernias.
3. Routine surgery.
4. Hernioplasty using developed methods of local prevention of postoperative wound complications and technique of hernial gate autodermaplasty and synthetic polypropylene net.
5. 1st-3rd operational-anesthesiological risk classes according ASA. *The exclusion criteria were:*

1. Small postoperative ventral hernias W1.
2. Emergency surgery on abdominal organs.
3. 3rd and 4th stages of oncological pathologies.
4. Recurrent postoperative ventral hernias.
5. 4th and 5th operational-anesthesiological risk classes according ASA.

The average age of the patients included to the research was 55±2.6 years. At the same time, patients over the age of 50 years prevailed in all groups: the main group – 78.05%, the 1st control group – 73.2%, the 2nd control group 72.5%, 3rd control group – 71.8% ($p>0.05$).

Female patients prevailed in the research – 99 (61.5%) of patients, men were 62 (38.5%). The distribution of patients in the researched groups by gender is given in Table 1, with no reliable difference in the indicators in the researched groups.

The character and frequency of associated diseases in the groups of patients with postoperative ventral hernias are shown in Table 2. According this indicator ill people in the researched groups were comparable.

Characteristics of hernias diagnosed in patients

We used the SWR-classification according to Chevrel & Rath (1999), adopted during the 21st International Congress of Herniologists in Madrid [24]. Table 3 is showing, that the main place during the research took patients with median localization 119 (73.9%), on the second place were the lateral abdominal hernias - 42 cases (26.1%).

Median abdominal hernias (M) were prevailed and diagnosed in 31 patients (75.6%) of the main and the 1st groups of comparison, in the 2nd group this indicator was 72.5% (29 patients from 39), and in the 3rd group of comparison – 71.8% (28 patients). The percentage of lateral hernias (L) was 10 (24.4%), 10 (24.4%), 11 (27.5%) and 11 (28.2%) correspondingly. Data show that patients in the researched groups were distributed evenly according to the localization of postoperative abdominal hernias (p>0.05).

Size of hernial gates of postoperative ventral hernias in the researched groups (Table 4) was also estimated.

Mostly patients were with postoperative ventral hernias W3 only 97 or 60.3%. The distribution of patients in the researched groups was comparable, and the difference in scores was also statistically insignificant (p>0.05).

Results of the research

Identification and characterization of postoperative complications

In total, after all herniotomy surgery in patients with postoperative ventral hernias, wound complications were established in 31 (19.3%) cases. The main type of complications is formation of seroma - 14 (8.7%) cases. Postoperative wound infiltrate was diagnosed in 12 patients or 7.5%. In 4 (2.5%) cases was observed suppuration of postoperative wounds. Hematoma formation of postoperative wound was observed in case of one (0.6%) patient (Table 5).

The frequency of wound complications depending of hernyoplasty kind and transplant location. Analyzing of indicators of the main group and of each group of comparison and, we observe the following. In the 1st group of comparison of patients with location of synthetic endoprosthesis according to the onlay method, wound complications were established in 13 (31.7%) patients in comparison with the main group, where complications were observed in 2 patients (4.9%), the difference in indicators was reliable (p<0.05). In the second group of patients with location of synthetic endoprosthesis according to the sublay method, wound complications were established in 10 (25%) patients compared to the main group, where the difference in indicators was also reliable (p<0.05). In the 3rd group of patients with location of synthetic endoprosthesis according to the inlay method, wound complications were established in 6 (14.6%) patients and the difference in indicators was insignificant (p>0.05), which indicates the lowest incidence of wound complications among patients among comparison group of ill people.

Estimation of hospitalization terms

The average length of stay of patients in the hospital was 9.9±0.11 bed days (Table 6).

Terms of inpatient treatment of ill people with postoperative ventral hernias in the 1st comparison group which underwent hernioplasty with polypropylene synthetic nets using onlay method were longer and up to 11.0±0.12 bed days, connected with the most number of wound complications during the early postoperative

period in comparison with the main group of patients, 8.3±0.1 bed days ($p<0.001$). The treatment terms of patients, underwent hernioplasty with polypropylene synthetic nets using “sublay” and “inlay” methods were respectively equal to 10.4±0.15 and 10.2±0.14 bed days, but these data were statistically significant more longer compared to the treatment terms of patients in the main group ($p<0.001$).

Long-Term Estimation of Hernioplasty Results

Estimation of the results according to the three point system in 12 months after operative treatment, when complete scars or hernias recurrences will be formed, is shown on Table 7. In 12 months after hernioplasty of postoperative ventral hernias, only 94 patients were interviewed due to the failure of some patients to attend a check-up and receive information about their health state.

In a year after surgery, 31 patients of the main group and 63 patients of the comparison group appeared for examination. Analysis showed that in the main group, were good results (1 point) were in 27 (87.1%) from 31 patients, in the 1st comparison group – in 7 (33.3%; $p<0.05$), in the 2nd comparison group – in 7 (35%; $p<0.05$) and in the 3rd comparison group in 11 (50%; $p<0.05$).

Satisfactory results (2 points) in the main group were obtained in 3 (9.7%) patients, against 8 (38.1%) patients of the 1st comparison group ($p<0.05$), and in 9 (45%) patients of the 2nd comparison group ($p<0.05$) and in 8 (36.4%) and in the 3rd comparison group ($p < 0,05$).

Unsatisfactory results (3 points) with the formation of hernia recurrence in the main group were established in 1 (3.2%) patient, against 6 (28.6%) patients of the 1st comparison group ($p<0.05$), and in 4 (20%) patients of the 2nd comparison group ($p<0.05$). In the 3rd comparison group in 3 (13.6%) patients had hernia recurrence ($p>0.05$).

In the whole, the share of good and satisfactory results in the main group was 96.8%, in the 3rd comparison group – 86.4%, in the 2nd comparison – 80%. The Significantly worse indicator was in patients of the 1st comparison group - 71.4% ($p < 0.05$).

Discussion

In total, there were 161 patients in both the main and comparison groups. After all herniotomy surgery in patients with POVH, wound complications were established in 31 (19.3%) cases. The research of comparative clinical effectiveness in the surgical treatment of postoperative ventral hernias between the main group of studies using autodermogernioplasty according to the methodology developed by us and the comparison groups, where hernioplasty of hernial gates with polypropylene nets with different methods of placing an allograft in the abdominal wall was used, shows the relationship of development of wound complications with an allograft. The best results are obtained in the main group of patients. So, in the 1st group of comparison of patients with the location of synthetic endoprosthesis according to the onlay method, wound complications were

established in 13 (31.7%) patients compared to the main group, where complications were observed in 2 patients (4.9%), the difference was valid ($p<0.05$). In the second group of patients with the location of the synthetic endoprosthesis according to the sublay technique, wound complications were established in 10 (25%) patients compared to the main group ($p<0.05$). Development of wound complications is mainly associated with the presence of foreign body, that is, the artificial mesh itself, tissue injuries with skin detachment and subcutaneous fiber to accommodate the transplants. In the 3rd group of patients with the location of the synthetic endoprosthesis according to the inlay method, wound complications were established in 6 (14.6%) patients ($p>0,05$). However, in case of using endoprosthesing of postoperative ventral hernias according to the inlay method are possible serious complications from abdominal organs in the form of formation of intraperitoneal adhesions and intestinal fistulas [25].

Autodermaplasty of postoperative ventral hernias according to the developed method made it possible to reduce the rate of wound complications to 4.9% from 31.7% ($p<0.05$) depending on the location of all endoprosthesis in the abdominal wall, as a result of which the length of inpatient treatment of patients was reduced 8.3±0.1 bed days from 11.0±0.12 ($p<0.001$) and was improved the proportion of good and satisfactory results of postoperative ventral hernias 96.8%.

Conclusions

1. Autodermaplasty of postoperative ventral hernias according to the method developed by us can help to reduce the number of wound complications to 4.9% from 31.7% ($p<0.05$) depending on the location of the endoprosthesis in the abdominal wall.

2. As a result of its application, the duration of inpatient treatment of ill people is reduced to 8.3±0.1 bed days from 11.0±0.12 ($p<0.001$), and proportion of good and satisfactory results is achieved up to 96.8%.

Statements and Declarations

There are no financial or non-financial conflicts of interest that are directly or indirectly related to the presented for the publishing research. The research has not been externally sponsored.

References

1. Sajyn AV, Loban KM, Ivahov GB, Petuhov VA, Glagolev NS, Andriyashkin AV, Ahmedov RR (2020) Modern concepts of ventral hernia surgery. Novosti Hirurgii 6:714-729. https://doi.org/10.18484/2305-0047.2020.6.714
2. Olmi S, Scaini A, Cesana GC, Erba L, Croce E (2007) Laparoscopic versus open incisional hernia repair: an open randomized controlled study. Surgical Endoscopy 21(4):555-559. https://doi.org/10.1007/s00464-007-9229-5
3. O'Dwyer PJ, Courtney CA (2003) Factors involved in abdominal wall closure and subsequent incisional hernia. Surgeon 1:17-22. https://doi.org/10.1016/S1479-666X(03)80004-5

4. Davila DG, Parikh N, Frelich MJ, Goldblatt MI (2016) The increased cost of ventral hernia recurrence: a cost analysis. Hernia 20(6):811-817. https://doi.org/10.1007/s10029-016-1515-5
5. Matveev NL, Belousov AM, Bochkar VA, Makarov SA (2020) Minimally invasive technologies in herniology: use cannot be saved. Hirurgiya 8:75-81. https://doi.org/10.17116/hirurgia202008175
6. Berger RL, Li LT, Hicks SC, Kao LS, Liang MK (2013) Development and validation of a risk-stratification score for surgical site occurrence and surgical site infection after open ventral hernia repair. J Am Coll Surg 217(6):974-982. https://doi.org/10.1016/j.jamcollsurg.2013.08.003
7. Belokonev VI, Zaharov VP, Grachov DB, Pushkin SYu, Kovaleva ZV, Pushkina DS (2021) Optimization of surgical treatment of abdominal hernias in obese patients. Vestnik Hirurgii 180(1):73-80. https://doi.org/10.24884/0042-4625-2021-180-1-73-80
8. Suryasa, I. W., Rodríguez-Gámez, M., & Koldoris, T. (2021). The COVID-19 pandemic. International Journal of Health Sciences, 5(2), vi-ix. https://doi.org/10.53730/ijhs.v5n2.2937
9. Semenov VV, Kurygin AA, Tapbaev SD, Mamoshyn AA. Sugregy Rives-Stoppa as a base fo the modern treatment way for patients with ventral hernias (55 years in surgery). Vestnik Hirurgii 179(6):107-110.
10. Shamsiyev AM, Davlatov SS, Saydullaev ZY. (2017) Prevention of wound complications in endoprosthetics of theabdominal wall for postoperative ventral hernias. Voprosy Nauki i Obrazovaniya 10(11): 163-167.
11. Vrijland WW, Jeekel J, Steyerberg EW, Den Hoed PT, Bonjer HJ (2000) Intraperitoneal polypropylene mesh repair of incisional hernia is not associated with enterocutaneous fistula. Br J Surg 87(3): 348-352. https://doi.org/10.1046/j.1365-2168.2000.01364.x
12. Cevasco M, Itani KM (2012) Ventral hernia repair with synthetic, composite, and biologic mesh: characteristics, indications, and infection profile. Surgical Infections 13(4):209-215. https://doi.org/10.1089/sur.2012.123
13. Abbsedze AI, Andreev AI, Anisimov AYu (2015) Prevention of early postoperative wound complications in hernioplasty of large ventral hernias. Vestnik Sovremennoi Klinicheskoi Mediciny 8(1): 11-18.
14. Ballantyne GH, Hourmont K, Wasielewski A. (2003) Telerobotic laparoscopic repair of incisional ventral hernias using intraperitoneal prosthetic mesh. JSLS 7(1):7-14.
15. Berger D, Bientzle M, Muller A (2002) Laparoscopic repair of incisional hernias. Der Chirurg 73(9):905-908. https://doi.org/10.1007/s00104-002-0541-2
16. Chowbey PK, Sharma A, Khullar R, Soni V, Baijal M (2003) Laparoscopic ventral hernia repair with extraperitoneal mesh: surgical technique and early results. Surg Laparosc Endosc Percutan Tech 13(2):101-105.
17. Franklin ME, Dorman JP, Glass JL, Balli JE, Gonzalez JJ (1998) Laparoscopic ventral and incisional hernia repair. Surg. Laparosc Endos. 8(4):294-299.
18. Antonova NA, Lazarev SM (2019) Prevention of early postoperative wound complications in hernioplasty of large ventral hernias. Vestnik Hirurgii named Grekov. 178(1):49-54. https://doi.org/10.24884/0042-4625-2019-178-1-49-54

19. Vinnik YuS, Petrushko SI, Michurov EI, Nazar'yants YuA (2019) Modern methods of surgical treatment of hernias and postoperative rehabilitation of patients with hernias of the anterior abdominal wall. Sovremennye Proplemy Nauki i Obrazovaniya. (2):124-124.
20. Franklin ME, Dorman JP, Glass JL, Balli JE, Gonzalez JJ (1998) Laparoscopic ventral and incisional hernia repair. Surg. Laparosc. Endosc. 8(4):294-299.
21. Cobb WS, Carbonell AM, Kalbaugh CL, Jones Y, Lokey JS (2009) Infection risk of open placement of intraperitoneal composite mesh. Am. Surg. 75(9):762-768. https://doi.org/10.1177/000313480907500905
22. Kazangapov RS, Imangazinov SB, Kairhanov EK (2019) Postoperative ventral hernia. Surgical treatment and prevention of wound complications: Literature Review. Nauka i Obrazovanie. 1:29-41.
23. Yanov VN (1975) Heat treatment of autodermal implants. Vestnik Hirurgii 116(9):90-91.
24. Bland M (2000) An Introduction to Medical Statistics, 3rd. ed. Oxford University Press, Oxford, 2000. pp 335-347.
25. Chevrel JP, Rath AM (1999) Polyester mesh for incisional hernia repair. In Schumpelick V, Kingsnorth AN (eds) Incisional hernia. Springer-Verlag, Berlin. pp 327-330.
26. Gorskíí VA, Sivkov AS, Agapov MA, Titkov BE, Shadskíí SO (2015) The first experience of intra-abdominal use of a single-layer collagen plate. Hirurgiya. (5):59-61.

Tables

Table 1. Distribution of patients with postoperative ventral hernias by gender in study groups

Localization of hernias	Main Group		Comparison Groups					
			the 1st group, onlay		the 2nd group, sublay		the 3rd group, inlay	
	abs.	%	abs.	%	abs.	%	abs.	%
Men	14	34.1	15	36.6	14	35	15	38.5
Female	27	65.9	26	63.4	25	65	24	61.5
In Total	41	100	41	100	40	100	39	100

Table 2. The character and frequency of associated diseases

The character of associated disease	Main Group	Comparison Groups			In Total
	n = 41	1st n = 41	2nd n = 40	3rd n = 39	
Coronary Heart Disease	8 (19.5%)	9	8	7	32
x2 p		0.074 0.79	0.05 0.823	0.012 0.915	
Hypertonic Disease	7 (17.1%)	8	8	7	30
x2 p		0.00 1.00	0.03 0.958	0.037 0.849	
Obliterating atherosclerosis of the lower extremities	1 (2.4%)	4	3	3	11
x2 p		0.852 0.357	0.29 0.591	0.319 0.573	
Postinfarction Cardiosclerosis	2 (4.9%)	3	3	3	11
x2 p		0.00 1.00	0.01 0.978	0.003 954	
Consequences of Acute Disorder in Cerebral Circulation	1 (2.4%)	2	2	2	7
x2 p		0.00 1.00	0.00 0.983	0.002 0.965	
Varicosity of the lower extremities	6 (14.6%)	6	5	4	21
x2 p		0.098 0.755	0.002 0.965	0.064 0.800	
COPD	2 (4.9%)	3	3	2	10
x2 p		0.00 1.00	0.001 0.978	0.213 0.645	

Chronical Pyelonephritis	4 (9.8%)	4	4	3	15
x2 p		0.139 0.710	0.113 0.738	0.005 0.945	
Obesity	3 (7.3%)	7	6	6	21
x2 p		1.025 0.312	0.557 0.456	0.620 0.431	
Diabetes Mellitus	7 (17.1%)	8	8	7	30
x2 p		0.00 1.00	0.003 0.958	0.037 0.849	
Note: Indicators **x2** and **p** of the basic group of ill people in comparison to indicators of ill people, groups of comparison					

Table 3. Distribution of patients in groups by localization of postoperative ventral hernias

Localization of hernias	Main Group		Comparison Groups						p
			the1st group, onlay		the 2nd group, sublay		the 3rd group, inlay		
	abs.	%	abs.	%	abs.	%	abs.	%	
M1	6	14.6	6	14.6	7	17.5	5	12.8	> 0.05
M2	14	34.2	15	36.6	14	35	14	35.9	> 0.05
M3	11	26.8	10	24.4	8	20	9	23.1	> 0.05
L1	4	9.8	4	9.8	6	15	4	10.3	> 0.05
L3	6	14.6	6	14.6	5	12.5	7	17.9	> 0.05
Total	41	100	41	100	40	100	39	100	
Note: M1 - supratum, M2 - supranatum, M3 – conjugation, L1– subcoatal L3 – iliac									

Table 4. Distribution of patients in researched groups according to the sizes of hernia gates

Localization of hernias	Main Group		Comparison Groups						p
			the1st group, onlay		the 2nd group, sublay		the 3rd group, inlay		
	abs.	%	abs.	%	abs.	%	abs.	%	
W2	9	22	8	19.5	8	20	7	18	> 0.05
W3	24	58.5	25	61	24	60	24	61.5	> 0.05
W4	8	19.5	8	19.5	8	20	8	20.5	> 0.05
Total	41	100	41	100	40	100	38	100	
Note: W2 – 5-10, W3 – 10-15 cm, W4 – more than 15 cm									

Table 5. Wound complications in operative treatment of postoperative vetral hernias

№	Indicator	Group of ill people in case of hernioplasty of POVH									
	Kind of wound complication	Main Group		Endoalloprosthesis Comparison Groups						In Total n=161	
		n=41		the 1st group, onlay		2nd group, sublay		3rd group inlay			
				n=41		n=40		n=39			
		n	%	n	%	n	%	n	%	n	%
1	Seroma	0	0	6	14.6	4	10	4	10.3	14	8.7
2	Infiltrate	2	4.9	4	9.8	4	10	2	5.1	12	7.5
3	Hematoma	0	0	1	2.4	0	0	0	0	1	0.6
4	Suppuration	0	0	2	4.8	2	5	0	0	4	2.5
Total		2	4.9	13	31.7	10	25	6	14.6	31	19.3
Note. Validity of key figure differences: P_1 (Main Group and the 1st Comparison Group): $p < 0.05$ P_2 (Main Group and the 2nd Comparison Group): $p < 0.05$ P_3 (Main Group and the 3rd Comparison Group): $p > 0.05$											

Table 6. Terms of inpatient treatment after hernioplasty of POVH

Indicator	Kind of hernioplasty of POVH				
	Comparison Group			Main Group, n=41	In Total, n=161
	the1st group, Onlay, n=41	the 2nd group, Sublay, n=40	the 3rd group, Inlay, n=39		
Treatment Terms, M±m	11.0±0.12	10.4±0.15	10.2±0.14	8.3±0.1	9.9±0.11
In days, M±m	10.5±0.1			8.3±0.1	9.9±0.11
Note. Reliability of Differences: P_1 (main group and the 1st comparison group): ($p < 0.001$) P_2 (main group and the 2nd comparison group): ($p < 0.001$) P_3 (main group and the 3rd): ($p < 0.001$)					

Table 7. Results of estimation of results of hernioplasty of postoperative ventral hernias according to three point system in 12 months after operation

Indicator	Kind of hernioplasty of POVH							
	Main Group		Endoalloprosthesis Comparison Groups					
	n=31		the1st group, onlay,		the 2nd group, sublay		the 3rd group, inlay	
			n=21		n=20		n=22	
	n	%	n	%	n	%	n	%
1point	27	87.1	7	33.3	7	35	11	50
2 points	3	9.7	8	38.1	9	45	8	36.4
3 points	1	3.2	6	28.6	4	20	3	13.6
Total	31	100	21	100	20	100	22	100

Figures' Legends

Figure 1. Preparation of auto skin for autodermal hernial gate plastics: a – processing of the skin flap, fixed along the perimeter with clamps, with solution of NaCl; b – depepithelialization of skin flap with scalpel; c - excision of subcutaneous fiber of autodermatransplant with curved scissors.

Figure 2. The moment of the beginning of auto skin suturing to the edge of the muscular-aponeurotic layer of hernial gate

Figure 3. Scheme of suturing of hernial gate: 1, 3 – short lateral U-sutures of muscular-aponeurotic layers; 2 – autodermal de-epithelized flap.