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Peculiarities of Wound Complications Prophylaxy at Alloplasty of Strangulated Postoperative Ventral Hernias

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Abstract **Aim** of the study was to improve the results of surgical treatment of strangulated ventral hernias by enhancement of tactical and technical approaches to preventing the development of postoperative complications. **Material and methods.** The authors conducted a study of 147 patients with strangulated ventral hernias operated on an emergency basis in the surgery department of the Andijan State Medical Institute clinics for the period from 2015 to 2020. All patients were divided into two groups: the main group included 56 patients with the indicated diagnosis; the comparison group included 91 patients. The age of the patients varied from 23 to 83 years. The mean age was 53.5 ± 1.3 years in the comparison group and 54.5 ± 1.4 years in the main group. The authors used a method for the prevention of wound purulent-inflammatory complications at alloplasty of strangulated postoperative ventral hernias, including the introduction of a drug into the operation wound. After fixation of the synthetic implant, Redon-type drainage systems were placed in the operating wound; 50 ml of "FarGALS" solution in a ratio of 1: 3 was used as a drug. **Conclusion.** The authors concluded that during the entire postoperative period statistically better indicators of the pain syndrome point scale were observed in the main group of patients ($t = 2.43$-3.18; $p < 0.05$).

Keywords Strangulated hernia, Alloplasty, Postoperative complications prophylaxy

1. Introduction

The use of mesh polymer endoprostheses in the treatment of ventral hernias has reduced the number of relapses, but has led to an increase of wound complications frequency. Not only purulent-inflammatory processes in the wound are distinguished among the complications, but also their effect on the probability of hernia recurrence. The problem of reducing the risk of wound infection development remains relevant [1].

A special category is made by patients with urgent indications for hernioplasty: at the development of a stargulated hernia, fistulas and other complications during the elimination of which the surgical wound is always susceptible to the development of microbial contamination [2]. The frequency of wound infection in these cases can reach 37% and more, which affects not only the outcome of the operation, but also leads to a significant increase in costs due to the need for additional procedures and a longer hospital stay [3]. All preventive measures should be comprehensively aimed at the three points of the surgical operation, which the World Health Organization summarizes as preoperative, intra- and postoperative measures [4].

Until now, various methods of antibiotic prophylaxis of hernioplasty wound complications, suturing of an operation wound, introduction of cytokines in the postoperative period, injection of a complex of autologous cytokines, puncture of the paraprosthetic cavity followed by the introduction of antiseptics, treatment of the operation wound surface and prosthesis with a flow of low-temperature argon plasma have been introduced into the practice of herniology. At the same time, the authors attribute to the disadvantages of antibiotic prophylaxis in hernia surgery their insufficient effectiveness in conditions of antibiotic resistance of nosocomial microflora and the appearance of antibiotic-resistant strains of microorganisms [5-6].

The disadvantages of methods of an operation wound suturing in order to prevent the formation of a residual cavity that contributes to the formation of seroma are their trauma and additional production of serous fluid due to the biological properties of the suture material. The necessity for special PVC tubes for the introduction of cytokines and the complexity of the preparation of the cytokines themselves in the conditions of urgent surgery, when the average time from the moment of the patient's admission to the surgery is 1 hour, is impossible [7,8].

Puncture procedures of the peri-prosthetic cavity followed by the introduction of antiseptics and evacuation of the contents from the cavity formations [9]; long-term vacuum aspiration of postoperative wounds seromas [10]; installation of drains and flow-through washing of the wound under ultrasound control [11] give a relatively short-term effect. All this creates the need for multiple punctures of seromas,

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suppuration of postoperative wounds and their drainage which can cause the development of a wound infection associated with pain for the patient.

Techniques for treating the surface of an operation wound and prosthesis with a flow of low-temperature argon plasma also have their disadvantages. Low-temperature plasma sources are technically sophisticated equipment with low economic efficiency. They can lead to the destruction of materials at the points of contact between the plasma and the treated surface. The use of atmospheric pressure discharges at high voltage (10-40 kV) requires a high level of safety [12].

Aim of the study was to improve the results of surgical treatment of strangulated ventral hernias by enhancement of tactical and technical approaches to preventing the development of postoperative complications.

This article presents a comparative analysis of the results of the application of an optimized technique for the prevention of wound complications at alloplasty of strangulated postoperative ventral hernias.

2. Material and Method

The study was based on the results of treatment of 147 patients with strangulated ventral hernias. All patients were performed emergency surgery in the department of surgery of the Andijan State Medical Institute from 2015 to 2020. All patients were divided into two groups: the main group included 56 patients with the indicated diagnosis; the comparison group included 91 patients. The age of the patients varied from 23 to 83 years. The mean age was 53.5 ± 1.3 years in the comparison group and 54.5 ± 1.4 years in the main group.

The average time of strangulation in both groups did not exceed 8 hours. Most often patients admitted within the first 2-4 hours after the strangulation of the hernia. The frequency of patients addressing for medical care later than 4 hours after strangulation was practically the same in both groups and made up 23.2% and 20.9% in the main and comparison groups, respectively, which excluded the negative impact of the strangulation time on the study results. The severity of the general condition of patients was assessed as average in the overwhelming majority - 91.1% (51) and 92.3% (84) in the main and in the comparison groups, respectively. There was a severe degree of the disease only in 3.6% (2) cases of the main and in 2.2% (2) cases of the comparison groups.

By the nature of the performed surgeries, the patients were distributed as follows: “onlay” prosthetics with suturing of the aponeurosis defect was performed in 44 (48.4%) patients in the comparison group and in 26 (46.4%) cases of the main group. “Onlay” prosthetics without suturing the aponeurosis defect was performed in 47 (51.6%) cases in the comparison group and in 30 (53.6%) patients in the main group. The distribution of patients by surgery type is presented in Table 1.

In the main group of patients a method for the prevention of wound purulent-inflammatory complications in alloplasty of restrained incisional ventral hernias, including the introduction of a drug into the surgical wound was used. At the same time, after fixation of the synthetic implant, drainage systems of the Redon type were placed in the operating wound, 50 ml of “FarGALS” solution is used as a drug in a ratio of 1: 3, with which first wound was treated intraoperatively and then through a three-channel tunnel catheter inserted into the wound twice a day for 3 days. The method is carried out as follows. The patient is performed surgical intervention due to a strangulated postoperative ventral hernia. After the stage of fixing the synthetic implant in the postoperative wound area, a Redon-type drainage system is placed in the space above the mesh endoprosthesis designed for active low-vacuum drainage. Further, the preparation "FarGALS" is injected into the operating wound, diluted in physiological solution up to 50 ml in a ratio of 1: 3. Then, a three-channel tunnel catheter is placed in the operating wound above the mesh endoprosthesis through which the” FarGALS” solution is injected twice a day for 3 days.

Table 1. Distribution of patients by surgery type

Type of surgery	Comparison group		Main group	
	absolute	%	absolute	%
Herniotomy, small bowel loop resection, “onlay” prosthetics with suturing of the aponeurosis defect	3	3.3%	3	5.4%
Herniotomy, small bowel loop resection, onlay prosthetics without suturing of the aponeurosis defect	5	5.5%	3	5.4%
Herniotomy, resection of the strand of the greater omentum, “onlay” prosthetics with suturing of the aponeurosis defect	23	25.3%	15	26.8%
Herniotomy, resection of the strand of the greater omentum, “onlay” prosthetics without suturing of the aponeurosis defect	14	15.4%	9	16.1%
Herniotomy, “onlay” prosthetics with suturing of the aponeurosis defect	18	19.8%	8	14.3%
Herniotomy, “onlay” prosthetics without suturing of the aponeurosis defect	28	30.8%	18	32.1%
Total	91	100.0%	56	100.0%

The use of drainage systems of the Redon type provides active low-vacuum drainage of the postoperative wound by creating optimal conditions for aspiration, minimizes tissue trauma during drainage, and provides aseptic manipulation. Tubes of Redon type systems are connected through a connector according to the principle from a smaller diameter to a larger one which contributes to long-term maintenance of the drainage system's patency.

The three-channel tunnel catheter is easily accessible and can remain in place for a long time. The location of the device in the wound eliminates the need for needle punctures. The introduction of the "FarGALS" through a three-channel catheter located in the wound over the prosthesis allows for uniform infiltration of the antiseptic agent along the perimeter of the wound surface. Control over the course of the wound process was carried out after the surgery. The evaluation criteria were: the patient's subjective sensations (the nature and intensity of pain), visual and palpation assessment of the condition of the wound (presence or absence of hyperemia, infiltration, edema of the edges, the amount and nature of the discharge from the wound). A 10-point visual analogue scale was used to assess the intensity of pain in the postoperative period. According to this scale slight pain corresponds to 1-2 points, moderate - 34 points, medium - 5-6 points, severe - 7-8 points and severe intolerant - 9-10 points.

3. Results and Discussion

According to the data obtained on a 10-point visual analogue scale, the intensity of pain on the 1st day after surgery was assessed as strong by patients both in the comparison group and in the main group, the mean values made up 7.8 and 7.2 points, respectively. On the second day, against the background of the adopted treatment tactics in the main group, the intensity of pain was lower than in the comparison group, and corresponded to 5-6 points (mean value - 6.5). In the future, this trend continued, and on the 6th day after the operation, patients in the main group noted moderate pain, while in the comparison group, patients noted pain of moderate intensity. The dynamics of differences in the intensity of postoperative pain can be more clearly traced in Fig. 1.

Thus, throughout the whole postoperative period, statistically better indicators of the pain syndrome point scale were observed in the main group of patients ($t = 2.43$-3.18; $p < 0.05$). Evaluation of the amount of discharge through the drains in the study groups showed that on the first day after the surgery in the main group of patients the volume of separated fluid averaged 71.3 ml, while in the comparison group it was 96.6 ml. On the 3rd day after surgery these indicators were 30.3 ml and 48.5 ml in the main and comparison groups, respectively. The graph of the changes dynamics in the amount of drainage discharge and statistical processing of the data showed that already on the first day after the surgery there was a significant difference in favor of the patients of the main group ($t = 5.49$; $p < 0.05$), which was kept throughout the period of drainage of the wound cavity (Fig. 2).

We referred long-term intake of exudate, seroma, infiltration, hematoma, and marginal skin necrosis of postoperative wounds to postoperative local complications. In the comparison group seroma was most often observed (9.9% (n = 9)), while in the main group this local complication was noted only in 1 (1.8%) case. Also, in the comparison group, 6 (6.6%) patients had a long-term intake of postoperative exudate, wound infiltration – in 5 (5.5%) cases and 3 (3.3%) patients had wound suppuration (Tab. 2).

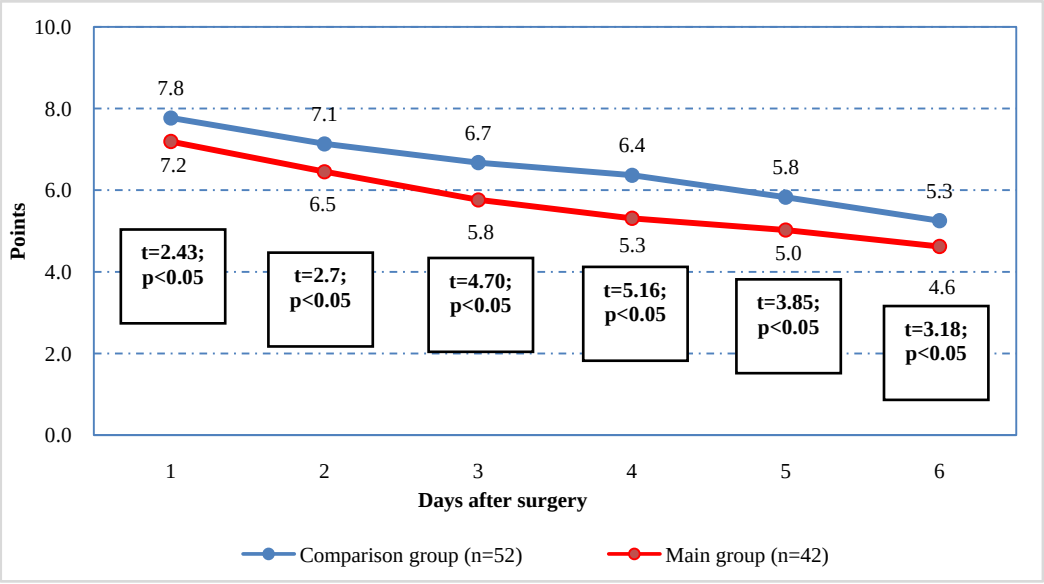

Figure 1. Dynamics of pain intensity by an analogue scale

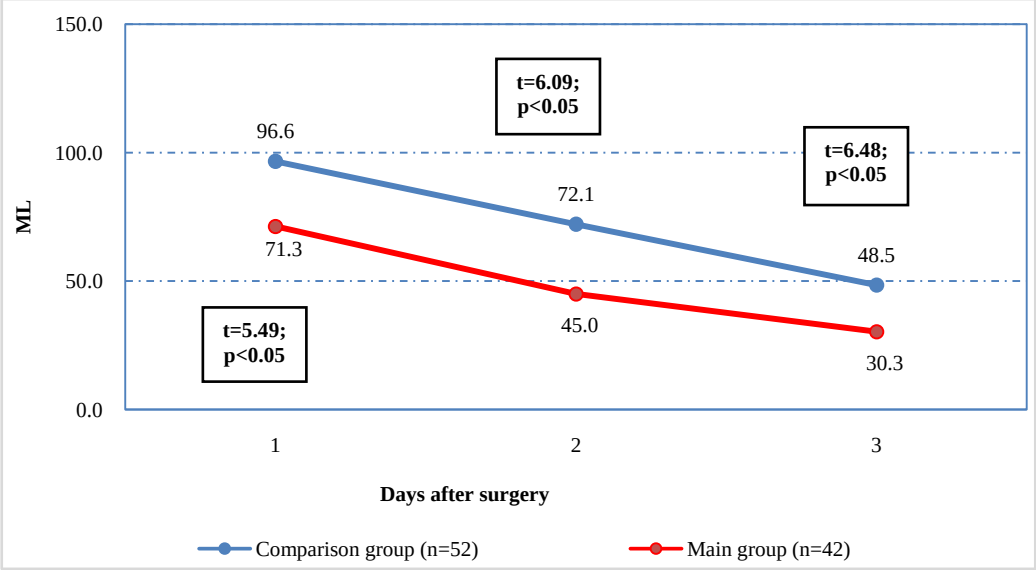

Figure 2. Dynamics of changes in the amount of drainage secretions (ml)

Table 2. The frequency of wound complications

Complications	Comparison group (n=91)		Main group (n=56)	
	absolute	*%*	*absolute*	*%*
Local				
Seroma	9	9.9%	1	1.8%
Wound infiltration	5	5.5%	2	3.6%
Wound suppuration	3	3.3%	0	0.0%
Hematoma	2	2.2%	1	1.8%
Marginal skin necrosis	1	1.1%	0	0.0%
Long-term intake of postoperative exudate	6	6.6%	1	1.8%

The following complications were observed up to 6 months after the surgery: infiltration of the surgical wound was observed in 6 (9.2%) patients of the comparison group and in 2 (4.3%) patients of the main group. At the same time, there were 7 (10.8%) patients with complications in the comparison group and 2 (4.3%) in the main group (Tab. 3).

Table 3. Complications rate up to 6 months of observation

Complication	Comparison group (n=65)		Main group (n=46)	
	absolute	***%***	***absolute***	***%***
Seroma	4	6,2%	1	2,2%
Wound infiltration	6	9,2%	2	4,3%
Ligature fistula	2	3,1%	0	0,0%
Detachment of the prosthesis	1	1,5%	0	0,0%
Hernia recurrence	1	1,5%	0	0,0%
Patients with complications	7	10,8%	2	4,3%

4. Conclusions

The use of the proposed method for intraoperative prevention of the wound complications development as preventive measures allowed to improve generally the results of surgical treatment of patients with strangulated ventral hernias. These measures made it possible to reduce the incidence of wound complications in the immediate period from 20.9% (in 19 from 91 patients in the comparison group) to 7.1% (in 4 from 56 patients in the main group). The patients stay in the intensive care unit also decreased from 1.5 ± 0.1 (in the comparison group) to 1.2 ± 0.1 days (in the main group), and in general, the hospital stay decreased from 7.7 ± 0.1 to 6 . 7 ± 0.1 days. The risk of developing long-term specific complications decreased from 10.8% (in 6 of 65 observed patients in the comparison group) to 4.3% (in 2 of 46 observed patients in the main group).

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