World Bulletin of Public Health (WBPH)
Available Online at: https://www.scholarexpress.net
Volume-23, June 2023
ISSN: 2749-3644

BACTERIAL CONTAMINATION OF THE SURGICAL WOUND IN PATIENTS WITH STRANGULATED POSTOPERATIVE VENTRAL HERNIAS

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Article history:

Received: April 11th 2023
Accepted: May 11th 2023
Published: June 20th 2023

Abstract:

One of the topical issues of modern allohernioplasty is the prevention of the development of wound complications, among which are the formation of infiltrates, seroma, wound suppuration, dislocation of the prosthesis and relapse of the disease.

Keywords:

INTRODUCTION.

One of the topical issues of modern allohernioplasty is the prevention of the development of wound complications, among which are the formation of infiltrates, seroma, wound suppuration, dislocation of the prosthesis and relapse of the disease. At the same time, a special role in the etiopathogenesis of these complications is assigned to two factors - the tactical and technical aspects of the operation and the degree of microbial contamination of the wound [1]. According to a prospective multicenter study in 25 centers in Italy (2020), the main complications of allohernioplasty were: removal of the infected mesh - 1.3%, infection requiring additional intervention - 4.0%, 8.0% relapses, 5.3% reoperations and 6.7% drainage of seroma [2]. In turn, the highest risk of developing a wound infection, reaching 42%, is observed during operations in conditions of initial bacterial contamination, which may be associated with infringement of the intestine and the need for resection of its necrotic part, or with the presence of skin fistulas in recurrent hernias, as well as in parastomal hernias with intestinal fistulas [3]. There is an opinion that in these conditions the use of synthetic mesh should be avoided, since there is a high incidence of severe infection of the wound and recurrent hernia [4]. However, most authors agree that one-stage hernia treatment in a contaminated wound using various prosthetic materials is still effective and provides a low recurrence rate, subject to certain therapeutic and preventive measures in the perioperative period [5].

To prevent the development of bacterial contamination of the wound, various local measures are offered. In particular, Minor S et al. (2020) investigated the properties of a new graft incorporating gentamicin into a biological extracellular matrix derived from the submucosa of the porcine small intestine. The authors state that topical application of gentamicin does not cause toxicity and reduces the risk of graft infection by up to 8% in a contaminated wound [6]. Another trend has been the development of slowly absorbable biosynthetic materials [7].

Three absorbable synthetic meshes are currently available: GORE BIO-A Mesh (Gore), TIGR Matrix Surgical Mesh (Novus Scientific) and Phasix Mesh (Bard). The conducted studies have stated that there is currently no available evidence to support the benefits of resorbable synthetic meshes compared to the use of synthetic or biological prostheses, mainly due to the lack of reliable data. More pilot studies are needed, followed by randomized controlled trials and prospective registries with sufficiently long follow-up to reveal their potential benefits in clinical practice [8]. No less interesting is the development of new prosthetic materials. Thus, the C-QUR V-PatchMesh™ prosthesis combines a unique knitted polypropylene mesh coated with omega-3 fatty acids, and the results of the technique showed a fairly low recurrence rate, but the infection rate was higher compared to other prosthetic materials [9]. Accordingly, along with the technical aspects of operations, an increasing importance is given to improving the tactical aspects of preventing the development of wound complications after allohernioplasty [10].

Thus, the main reasons for unsatisfactory results after surgical treatment of strangulated ventral hernias are various technical factors that affect the incidence of local complications of allohernioplasty. Against this background, an open specific issue remains the improvement of preventive measures aimed at all stages of the pathogenesis of the development of postoperative complications, including optimization of the wound drainage technique to prevent the formation of seromas and the possibility of a local effect on wound infection and the standardization of perioperative antibiotic therapy.

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The aim of the research was to determine the microbial flora and the degree of contamination of the wound in patients with strangulated ventral hernias. It is assumed that the results of the research contribute to the improvement of therapeutic and preventive measures.

MATERIAL AND METHODS.

The analysis of the results of sowing in the studied samples of clinical material in 34 patients intraoperatively from the wound after the stage of allohernioplasty and from the drainage discharge in the postoperative period was carried out. Each patient was sampled three times. The first sample for the study was carried out after the stage of allohernioplasty from the wound in the area of the prosthesis, while in the main group the sampling was carried out after the wound was treated with the domestic antiseptic FarGALS. The second sample was taken from the discharge through the drains for 1-2 days and the third sample from the discharge through the drains for 3-5 days. For sowing, the smear was carried out using a sterile cotton swab. The test material was processed in the microbiological laboratory of the clinic no later than 1-2 hours from the moment of sampling. The inoculation of the obtained samples was carried out on standard differential diagnostic media.

The species specificity of isolated microorganisms was determined using conventional methods using identification media. The sensitivity of microorganisms to antibiotics and antifungal drugs was determined by diffusion into agar from disks. The antimicrobial activity of FarGALS was determined by the agar diffusion method.

It should be noted that the technology for the development of the drug "FarGALS" was declared an international priority in 110 countries of the world in the European Patent Office. At present, "FarGALS" is widely used in many branches of medicine, in particular in surgery, gynecology, combustiology, otorhinolaryngology, dentistry, etc.

According to pharmaceutical properties, the drug belongs to antiseptic and wound healing agents. "FarGALS" has a wide spectrum of antimicrobial activity (active against gram-positive and gram-negative, aerobic and anaerobic, non-spore-forming and spore-forming bacteria, etc., fungi of the genus Candida, as well as Helicobacter pylori).

RESULTS.

The analysis of the results of sowing in the studied samples of clinical material in 34 patients in the comparison group was carried out intraoperatively from the wound after the stage of allohernioplasty and from the drainage discharge in the postoperative period on days 1-2 and 3-5 (Table 1). Various types of microorganisms have been isolated.

Of the inoculated strains in the intraoperative material, Enterobacter spp. (47.1%) was often sown in 16 cases, followed by the frequency of Staphylococcus spp. (23.5%; 7 samples), Streptococcus spp. (17.6%; 6 samples) Micrococcus spp. and Acinetobacter spp. (14.7%; 5 samples).

In the postoperative period on the 1st day Staphylococcus spp. (35.3%; 12 samples) and Streptococcus spp. (26.5%; 9 samples) were sown most frequently. At the same time, this picture was also noted on the 3rd day, the genus Candida also joined - 5.9% (2 cases) and Pseudomonas aeruginosa - 5.9% (2 cases). For other strains of microorganisms, the frequency of detection decreased.

Table 1. Results of sowing from the wound after the stage of allohernioplasty and in the postoperative period

Seeded flora	Intraoperatively		1 day		3 days	
	abs.	%	abs.	%	abs.	%
Enterobacter spp.	16	47,1%	7	20,6%	4	11,8%
Staphylococcus spp.	8	23,5%	12	35,3%	6	17,6%
Streptococcus spp.	7	20,6%	9	26,5%	4	11,8%
Klebsiella spp.	6	17,6%	6	17,6%	2	5,9%
Micrococcus spp.	5	14,7%	2	5,9%	1	2,9%
Acinetobacter spp.	5	14,7%	4	11,8%	1	2,9%
Enterococcus spp.	4	11,8%	6	17,6%	2	5,9%

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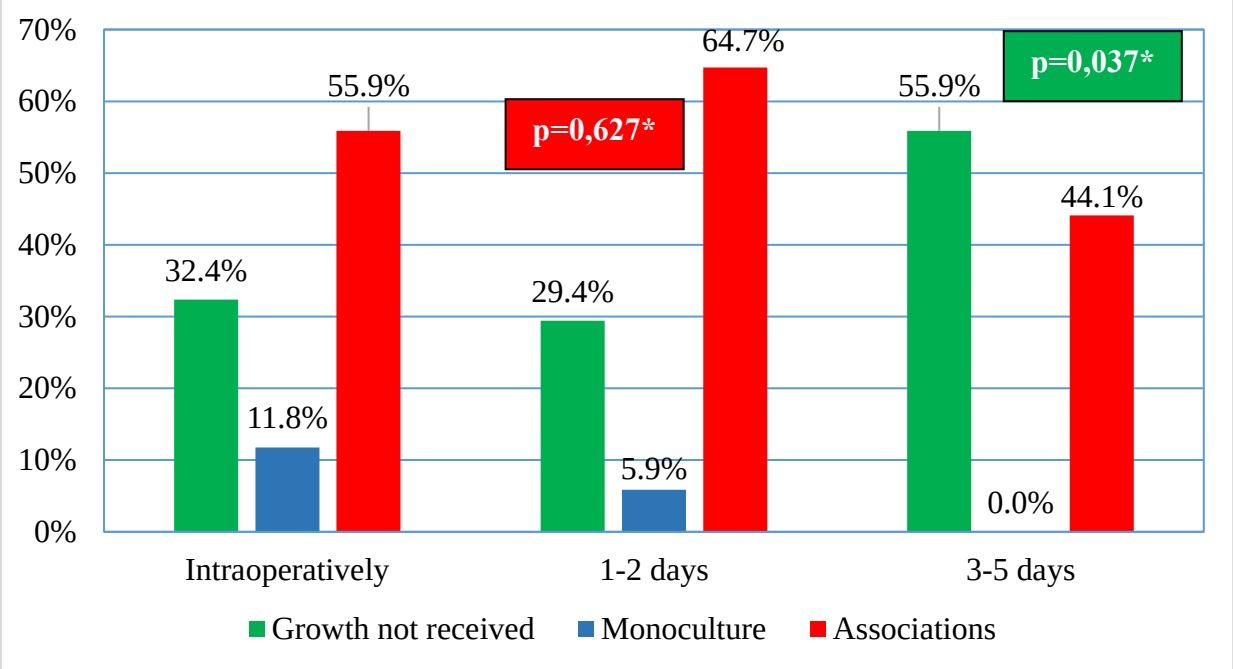
Esherichia coli	3	8,8%	4	11,8%	1	2,9%
Proteus spp.	3	8,8%	1	2,9%	1	2,9%
Pseudomonas aeruginosa	0	0,0%	0	0,0%	2	5,9%
mushrooms.p.Candida	0	0,0%	0	0,0%	2	5,9%



Indicators for 1-2 days in relation to intraoperative - χ2=0.934; Df=2; p=0.627
Indicators for 3-5 days in relation to intraoperative - χ2=6.604; Df=2; p=0.037

Figure 1. Dynamics of microbial growth from discharge through drains

The study of the dynamics of microbial growth from the discharge through the drains (Fig. 1) showed that on the 1st-2nd day after the operation, in 64.7% (22 samples) cases, associations of various strains of microorganisms were noted, while growth was not obtained only in 29.4 % (10 trials) cases, which had no statistically significant difference in relation to intraoperative parameters (χ2=0.934; Df=2; p=0.627). Against the background of the therapy on days 3-5, growth was not obtained in most cases, which amounted to 55.9% (19 samples), however, the frequency of detection of associated growth of microorganisms was also high and amounted to 44.1% (15 samples). At the same time, the indicators on days 3-5 in relation to intraoperative ones were statistically significant (χ2=6.604; Df=2; p=0.037).

Sensitivity indices to various antibacterial agents were determined in 21 patients in the comparison group (Table 2).

Table 2. Indexes of sensitivity to various antibacterial agents

Drugs	S *		R		SR	
	abs.	%	abs.	%	abs.	%
intraoperative seeding						
Amoxicillin	16	76,2%	4	19,0%	1	4,8%
Amoxicillin + clavulanate	18	85,7%	1	4,8%	2	9,5%
Cefotaxime	20	95,2%	0	0,0%	1	4,8%
Cefepime	21	100,0%	0	0,0%	0	0,0%

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Ceftazidime	19	90,5%	1	4,8%	1	4,8%
Ofloxacin	20	95,2%	0	0,0%	1	4,8%
Ciprofloxacin	21	100,0%	0	0,0%	0	0,0%
Levofloxacin	21	100,0%	0	0,0%	0	0,0%
Cefazolin	17	81,0%	2	9,5%	2	9,5%
Cefoperazone	21	100,0%	0	0,0%	0	0,0%
Ceftriaxone	21	100,0%	0	0,0%	0	0,0%
Cefoperazone + sulbactam	21	100,0%	0	0,0%	0	0,0%
seeding for 3-5 days						
Amoxicillin	8	38,1%	9	42,9%	4	19,0%
Amoxicillin + clavulanate	15	71,4%	4	19,0%	2	9,5%
Cefotaxime	15	71,4%	1	4,8%	5	23,8%
Cefepime	17	81,0%	1	4,8%	3	14,3%
Ceftazidime	18	85,7%	1	4,8%	2	9,5%
Ofloxacin	19	90,5%	0	0,0%	2	9,5%
Ciprofloxacin	20	95,2%	0	0,0%	1	4,8%
Levofloxacin	20	95,2%	0	0,0%	1	4,8%
Cefazolin	12	57,1%	5	23,8%	4	19,0%
Cefoperazone	19	90,5%	1	4,8%	1	4,8%
Ceftriaxone	19	90,5%	1	4,8%	1	4,8%
Cefoperazone + sulbactam	21	100,0%	0	0,0%	0	0,0%

Note: S - susceptible strain, R - resistant strain, SR - intermediate sensitivity.

Analysis of the antibiogram of intraoperative samples showed that in 95.2% of cases, sensitive strains of microorganisms were detected for cefotaxime and ofloxacin, while in 100% of cases the strains were sensitive to cefepime, ciprofloxacin, levofloxacin, cefoperazone, ceftriaxone and cefoperazone / sulbactam. Thus, full sensitivity was revealed to the group of III and IV generation cephalosporins, II and III generation fluoroquinolones, and inhibitor-protected antibiotics (cefoperazone/sulbactam).

Of all the tests performed in the postoperative period (days 3-5), only ciprofloxacin, levofloxacin and cefoperazone/sulbactam can be distinguished, to which 95-100% sensitivity was found (Table 2).

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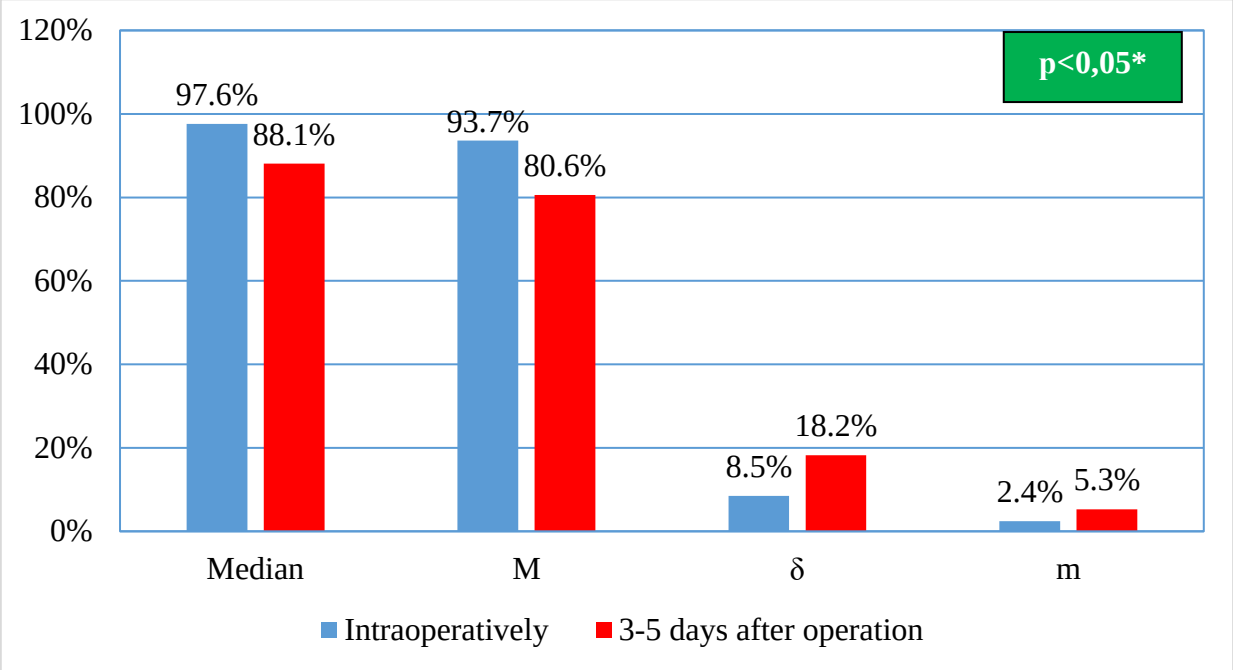

Statistical indicators: median; M - average value; δ is the standard deviation; m is the mean error. T-test between groups – t=2.26; p<0.05

Figure 2. Average sensitivity index for all drugs

On average, the sensitivity index for all drugs (Fig. 3) according to the results of cultures of intraoperative samples was 93.7±2.4%. In the postoperative period, from the cultures of drainage samples, this indicator was equal to 80.6±5.3%, which meant a significant decrease in sensitivity in dynamics with the development of resistance of strains to the selected therapy (t=2.26; p<0.05).

The data obtained during the study made it possible to choose the most appropriate scheme of systemic antibiotic therapy for patients with strangulated ventral hernias of the anterior abdominal wall, namely, the use of inhibitor-protected cephalosporins (cefoperazone / sulbactam) on the first day with subsequent transfer to fluoroquinolones (ciprofloxacin or levofloxacin).

CONCLUSION. Prevention of the development of wound complications after alloherniplasty for strangulated ventral hernias should be carried out perioperatively, since the study of the qualitative and quantitative composition of bacterial contamination after the stage of prosthetics showed the absence of colony growth only in 32.4% of patients, in 11.8% of cases a monoculture was sown, and in the remaining 55.9% of patients - various microbial associations. The fact of high contamination of the surgical wound is explained by the high frequency of infringement of the loop of the small intestine with the development of intestinal obstruction in some cases.

At the same time, postoperative antibiotic therapy, chosen empirically, included the use of various groups of drugs, that is, without a standardized approach. This is what led to the preservation of the positive growth of microbial colonies in 44.1% of patients in 44.1% of patients. Thus, the average sensitivity to antibacterial drugs when sowing from the surgical wound reached 93.7±2.4%, while in dynamics this indicator significantly decreased to 80.6±5.3% (t=2.26; p<0, 05), which is associated with the development of resistance of strains to the chosen therapy.

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