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THE INFLUENCE OF DIFFERENT DOSES OF ULTRAVIOLET RAYS ON THE RESISTANCE OF PATHOGENIC MICROORGANISMS IN EXPERIMENT (IN VITRO)

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ABSTRACT:

Wound infection, including postoperative infection, continues to be one of the most pressing problems in surgery. The problem of microflora resistance makes it difficult to obtain positive results of purulent-surgical diseases of soft tissues. There is little research in the literature devoted to suppressing existing antibiotic resistance.

Keywords: purulent wound, microorganism, resistance, ultraviolet rays.

INTRODUCTION:

Medical science and practice are faced with an urgent need to search for affordable and, at the same time, effective drugs and approaches to the treatment of wound infection that meet modern requirements. The solution to this problem requires deep knowledge of the pathogenesis of the wound process, the microbiology of a purulent wound.

Purulent complications account for 30–35% of all surgical diseases, and in the structure of hospital infections in a surgical clinic, wound suppuration ranges from 2–3% to 11–62.2% [3]. More than 1/3 of patients with a surgical profile have a surgical infection of varying degrees [4]. Over time, there is a change in the etiological structure of surgical infection, its pathomorphosis as a result of the wide and uncontrolled use of antibacterial drugs, the spread of prolonged infusion therapy, the expansion of indications for invasive methods of diagnosis and treatment [5, 6, 7]. The increase in the frequency and severity of surgical infection, insufficient effectiveness of traditional methods of treatment determine the significance of this problem, which is currently considered as one of the main ones in surgery [8, 2, 9, and 10]. According to some studies, the number of deaths due to infectious complications is 42-60% [11, 5]. The effectiveness of the fight against pathogens of surgical infection directly depends on their resistance to antibacterial drugs. Difficulties in treating wounds with antibiotics due to the high resistance of micro flora prompted the search for an additional, more effective and generally available method of local treatment. One of these methods is a study of the directed application of chemical methods with the aim of bactericidal and simultaneous suppression of antibiotic resistance of the micro flora of wounds. Based on this, we decided to study the effect of dimethyl sulfoxide solution on micro flora resistance. To solve this problem, laboratory and experimental studies were carried out, allowing them to be further introduced into clinical practice.

THE AIM OF THE STUDY:

There was a laboratory study of the microbiological activity of dimethyl sulfoxide, the identification of the optimal concentration of the solution with the maximum bactericidal and suppressive properties of the resistance of pathogenic micro flora invitro.

MATERIALS AND METHODS:

Considering that in our practice the majority of cases (up to 60-70%) with purulent-surgical diseases were sown with S. aureus as the main pathogenic flora, the experiment was carried out on the micro flora of S. aureus. The method of obtaining clinical material was a biopsy intraoperative material, as well as an imprint (smear, scraping, aspirate) of wounds. The inoculation of pathogenic microorganisms on nutrient agar on Petri dishes was carried out at a dilution of 1010 mt / ml.

To determine the maximum effective UVB bio dose, exposure to ultraviolet rays on the agar surface was carried out in the following versions of various doses in 6 series: I-control without exposure to ultraviolet rays, exposure to UVB II-1.0 bio doses, III-1.25 bio doses, IV-1, 5 bio doses, V-1.75 bio doses, VI-2.0 bio doses of ultraviolet irradiation.

Each series of experiments was carried out in 10 Petri dishes, seeded micro flora. After 24 hours, the microfloras were subcultured into pure agar, and then the sensitivity of the selected 15 different antibiotics was determined.

After the end of the incubation, the dishes were placed upside down on a dark matte surface so that the light fell on them at an angle of 45 ° (counting in reflected light). The diameter of the growth inhibition zones was measured with an accuracy of 1 mm using a caliper.

RESULT AND DISCUSSION:

The conducted experimental research revealed the following: when exposed to pathogenic microorganisms with ultraviolet rays, a similar pattern of dynamics of sensitivity to antibiotics of bacteria was observed as in the first series of experiments. So, when exposed to ultraviolet irradiation, micro flora with an increase in the bio dose of radiation began to lose resistance to antibiotics. What was manifested by an increase in the number of antibiotics in which the micro flora is sensitive? By increasing the dose of exposure to radiation, the sensitivity of the micro flora to antibiotics appeared, which, without exposure to UV rays, did not have sensitivity.

Table No. 1. Sizes of growth retardation zones in the AGV environment of S. aureus pathogen after exposure to various doses of UFO.

Antimicrobial drug	UFO biodose					
	0	1,0	1,25	1,5	1,75	2,0
Oxacillin	-	-	-	-	8,2+1,2	12,1+0,8
Cefazolin	17,46+1,6	20,28+1,4	23.6+1.1	24.2+1.2	26.8+1.2	28.01+0.6
Cefuroxime	-	-			7,6+1,2	12.5+0.8
Cefotaxime	21,72+0,84	24,2+1.1	25.33+0.6	26.4+0.7	28.1+0.9	28.6+1.3
Gentamicin	-	-	-	9,2+0,76	14,6+0,84	21,5+0,83
Levomycetin	-	-	-	-	-	-
Rifampicin	12,27+1,8	15.4+1,21	18,2+1,0	22,8+1,33	24,9+1,37	26,6+1,7
Erythromycin	-	-	-	-	-	
Tetracycline	-	-	-	-	-	16,6+0,9
Ciprofloxacin	-	-				
Amikacin	-	-	-	-	14,8+0,6	22,4+1.2
Cefoperazone	21,5+0,6	21,9+0.72	22,04+1,3	23,8+1,2	25,4+1,3	26,7+1,9
Moxofloxacin	18,34+1,7	20,2+0.78	22,4+1.1	24,2+0.91	26,8+0.83	27,9+1.1
Benzylpenicillin	-	-	-	-	-	-
Ampicillin	-	-	-	-	-	-
Sensitivity in%	5 (33,3%)	5 (33,3%)	5(33,3%)	6(40%)	9(60%)	10(66,7%)

Note: * - resistant to antibacterial drugs;

The maximum peak of the expected results was achieved when exposed to ultraviolet rays at two biodoses (according to Dalfeldo-Gorbachova).

It should be noted for the purpose of maintaining the synchronicity of the I and II part of the experiments, for the second part of the experiments, a similar source of material was used as a source of material isolated pathogenic microflora S. aureus from purulent foci of patients in which the first part of the experiment was used. Therefore, the initial sensitivity to the antibiotic of the microflora was identical to that of the first part of the test

(Table No. 1), of which 33.3% of the 15 antibiotics were found to be sensitive.

When exposed to 1.5 biodoses of UV rays, the sensitivity to antibiotics increased to 40%, when exposed to 1.75 biodoses of UV rays, 60% were noted, with 2.0 biodoses, the sensitivity to antibiotics increased to 66.7%.

Thus, our experimental studies in vitro revealed the use of the physical method of ultraviolet irradiation in various doses, in addition to the destructive effect of antibiotics, suppresses microflora resistance. At the same time, the use of ultraviolet irradiation at two biodoses (according to Dalfeld-Gorbachov) is the optimal dose. All this allows us to use such a dose of UV radiation in clinical practice in order to achieve the maximum effect from the position of suppressing microflora resistance is optimal.

CONCLUSIONS:

In addition to antibacterial action, ultraviolet rays have a suppressing effect of microflora resistance.Ultraviolet rays in two biodoses exhibit maximum resistance-suppressing properties of microflora S. aureus.When treating purulent-surgical diseases with the use of ultraviolet rays in the course of treatment, it is necessary to determine the repeated sensitivity of microflora to antibiotics, which will expand the choice of antibiotics in the course of treatment.

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