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## THE METHOD OF TREATMENT OF PURULENT WOUNDS WITH AERODISPERSE MIXTURE IN THE CONDITIONS OF MANAGED HIGH PRESSURE

**Summary.** Multimodality therapy of purulent wounds remains one of acute issues in surgery. Surgical method combined with local treatment still remains the basic one in wound healing. The tendency of recent decades — the treatment of wounds in a moist environment. The article describes the method and results treatment of purulent wounds in a new way — aerodisperse mixture under the local control of high pressure.

**Key words:** *purulent wound, moist treatment of wounds, aerodispersive mixture.*

### Introduction

Today, according to domestic and foreign literature, surgical patients with purulent-inflammatory diseases range from 35 to 45 %, American authors claim that the share of infections of surgical wounds is 15 % of the total number of nosocomial infections among surgical patients with nosocomial infections, is the biggest group [8]. Mortality in surgical purulent infection and its complications, especially in sepsis and septic shock in the last decades did not decrease and ranges from 40 to 60% [3]. The majority of antimicrobial drugs used in the treatment of septic wounds effect mainly on the surface of the wound and do not contribute to elimination of microbial lesions deep in the affected tissues [6]. In the treatment of purulent wound first and the main method remains surgical debridement, during which all necrotic tissues are excised and bacterial contamination of the wound is reduced. Local treatment is an important step in wound healing and should be based on a clear understanding of the pathogenesis of wound healing phases and postulate that all wounds heal according to unified biological laws. This in turn causes the common principles of their treatment [4]. The first phase of wound healing is aimed at wound cleaning, lysis of necrotic tissue, drainage of fluid, elimination of infection. Tactics of local treatment in the second and third phases, usually is prevention of reinfection, mechanical and hyperosmotic wound damage [5]. One of the important aspect of treatment of wounds of any genesis is supporting of moist environment in the wound, which in turn positively affect mitosis, accelerates the growth of fibroblasts, formation of fibronectin, a vascular factor synthesis, maturation of granulation tissue. In addition, moist environment provides high protease activity in the wound, prevents drying of nerve endings and, consequently, reduces pain [1, 2, 7]. Also decrease of inflammatory reaction and severity of scarring is observed [7, 8]. Wound dehydration, in turn, causes the loss of important proteins, cytokines and slows cell migration. Doubtless factor in healing is sufficient wound aeration, especially

in the case of anaerobic infections. Therefore, it is reasonable to use such means of local treatment that can provide free gas exchange in the wound. Overall, hypoxia promotes prolongation of wound healing [1]. Another important point in the treatment of purulent wounds is adequate drainage. It is only right choice of drainage system is the key to rapid wound cleaning and reduction of the inflammatory phase of wound healing, reduction of dressings, minimizing wound trauma [4]. Wide application of modern interactive dressings, which allow optimal water- and gas exchange between the wound and the environment constrained by high cost and limited range of the drugs included in their composition. Hydrophilic ointment with all the positive qualities have a number of drawbacks, chief among them are the incompatibility of foundations with certain medicinal substances and syneresis phenomenon - the spontaneous release of the dispersion medium from the structure of the gel, followed by excessive moistening of wound edges. An important factor is the lack of wound aeration when using this treatment. All this underlines the need to find new and effective at the same time inexpensive methods of local treatment of wounds.

### Material and Methods

Taking into account all of the factors above, we have developed a method of septic wound treatment with aerodispersive mixture in conditions of managed high pressure that can be used successfully as in the first and in the second phase of wound healing. The method uses the advantages of aerosol delivery of drugs and the pressure in the cavity of the wound with simultaneous draining. Principle of operation: after debridement, the film is glued wound around or colostomy bag can be used. Nebulizer generates an aerosol of drug that through the drain hole in the colostomy bag or hole in antibacterial film «Ioban» enters the sealed space above the wound. This creates overpressure. In the lower hood section of the wound drainage tube is placed as option — conducted through a separate incision



in the skin and connected to the container with antiseptic. The height of the liquid varies depending on the desired pressure aerosol-air mixture over the wound. Colostomy bag allows to explore the wound, perform necrectomy at any time, without removing the adhesive plate and drainage. This method of treatment has several advantages: speed to achieve a therapeutic effect, including anaesthetization with a minimum number of analgesic drug, a small system performance; possibility of phased using of different drugs; healing in a natural, wet environment; high pressure contributes to wound aeration, opens closed «pockets», promotes better outflow of fluid.

### Results and discussion

By this method we treated 16 patients aged from 21 to 76 years, among them women — 6, men — 10 with purulent disorders of the lower extremities and torso, 8 (50%) with anaerobic infection. The treatment is performed after radical surgical treatment. For aerosol used compressor nebulizer «Flaem Nova Boreal 400» with the compressor outlet pressure of 1.5 bar and a replaceable spray rapidflaem-2 (RF-2), which generated 2–10 microns particles and created pressure up to 0.15 bar. Spraying performed twice a day during 20–25 minutes. The procedure carried out in the dressing room after sterilization. After determining the sensitivity to antibiotics and re-sampling of material on bacterial inoculation,

conducted spraying of  $\frac{1}{4}$  middle therapeutic dose of the sensitive antibiotic, followed by microbiological examination of wound surface. The results are interpreted on the 1st, 3rd, 5 days.

All patients achieved a positive outcome, that manifested in accelerated wound cleaning, reduction of the duration of the inflammatory phase, early appearance of granulation, the disappearance of pain, temperature reaction. Morphological features of these changes (on 3rd day) was a significant reduction in neutrophil infiltration, increased the number of fibroblasts, reduction of the inflammatory response. Bacteriological study confirmed the high activity of local antibiotic therapy in the form of medicinal aerosol. The absence of colonies on the Petri dish after using this method of treatment is noted with a significant microbial growth in the control cup. The same tendency has continued throughout the period (3 days) of microbiological research.

### Conclusions

Thus, the use of aerosol-drainage method of treatment is pathogenetically justified, effective, simple and at the same time inexpensive treatment for septic wounds treatment. Some technical issues remain open and the need for further improving of the method with conducting of comparative evaluation of effectiveness.

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СПОСІБ ЛІКУВАННЯ  
ГНІЙНОЇ РАНИ В  
УМОВАХ КЕРОВАНОГО  
ПІДВИЩЕНОГО ТИСКУ  
АЕРОДИСПЕРСНОЮ  
СУМІШШЮ.

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**Резюме.** Комплексне лікування гнійних ран залишається однією з актуальних проблем хірургії. Основним в лікуванні ран залишається хірургічний метод в поєднанні з місцевим лікуванням. Тенденція останніх десятиліть є лікування ран у вологому середовищі. У статті наведено методику та результати лікування гнійних ран новим способом – аеродисперсною сумішшю в умовах локального керованого підвищеного тиску.

**Ключові слова:** *гнійна рана, вологе ведення ран, аеродисперсна суміш.*

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СМЕСЬЮ

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**Резюме.** Комплексное лечение гнойных ран остается одной из главных проблем хирургии. Главным в лечении ран остается хирургический метод в сочетании с местным лечением. Тенденция последних десятилетий – лечение ран во влажной среде. В статье описана методика и результаты лечения гнойных ран новым способом – аеродисперсной смесью в условиях локального управляемого повышенного давления.

**Ключевые слова:** *гнойная рана, влажное ведение ран, аэродисперсная смесь.*