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# Effectiveness of topical application of an abacterial medium with a 25% dimethyl sulfoxide solution in the treatment of purulent hand diseases

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**Abstract:** Based on the objectives of the study, the next stage of the work was aimed at studying the effect of the local abacterial environment on the healing process of purulent wounds of the hand. For this purpose, an abacterial medium with диметилсульфоксидаа 25% dimethyl sulfoxide solution was used, the method of which is described in detail in chapter II of the paper. The obtained results of the conducted studies make it possible to recommend the widespread use of a local abacterial medium with a 25% dimethyl sulfoxide solution in the treatment of purulent inflammatory surgical diseases of the fingers and hand in outpatient settings according to the developed method.
**Keywords:** abacterial media, dimethyl sulfoxide,purulent inflammatory diseases, Methyluracil and Levomecol.

## INTRODUCTION.

**Relevance:** Purulent inflammatory diseases in the form of panaritia and phlegmon of the hand, as a result of infection of the received micro-injuries (wounds), often result in disability of patients, since in the initial stages microtraumas are not always detected by doctors.

From the socio-economic point of view, diseases of this group bear both financial (payment for the time of disability of employees on sick leave) and economic damage (reduced labor productivity), based on the problem of their high frequency. Therefore, the problems of diagnosis, treatment, and prevention of complications of purulent diseases of the hand do not lose their relevance today.

The entire volume of research conducted and statistical trends taken into account by scientists and surgeons focuses on the general conclusion: an indifferent attitude to microtrauma, expressed in the absence of antimicrobial treatment of small wounds and in neglect of medical care, led to complications in the form of phlegmon and panaritia, since the drainage function of the narrow wound channel was disrupted due to its closure.

In his work, Kraynyukov P. E. (2010) also provides evidence of the danger of various abrasions and small wounds on the hands, as a result of a study of 787 MI (24% of all inpatient patients with purulent pathology of various localization) patients with GVZK. It is worth noting the fact that the majority of patients were men with working capacity. Only in 1.1% of cases, this diagnosis was made to women. According to the nosological forms of diseases, the following structure was presented: panaritia – 70.4% of cases, abscesses - 20.7% of cases, phlegmons-8.9% of cases. Moreover, in patients, the right hand was more often affected in 78% of cases ($p < 0.05$). Panaritium was more often diagnosed on the first finger of the hand - 48%, on the second - 33% and on the third-13% of cases. Panaritium on the fourth and fifth fingers was diagnosed less frequently in 4% and 1% of cases, respectively. Thus, it can be seen that the greatest labor load falls on the first three fingers.

Damage to the nail phalanx was observed in 77% of cases, the middle phalanx in 13% of cases and the main phalanx in 7% of cases. Lesions on both phalanges were observed simultaneously in 3% of cases.

There were also observations of the presence of purulent-inflammatory diseases on the palms and on the back of the hand - 75% and 24%, respectively. [34; p. 48-51].

According to Krainyukov P. E., the dangerous season of GVZK occurrence is the spring-summer period, and for finger panaritia - winter. During this period, the disease manifests itself in a formal form. Exceeding the time limit for going to the doctor for 7.5 days leads to serious complications. [56; pp. 62-65].

Gunpowder use is a common cause of hand burns in the modern world. Injuries are mostly minor injuries that can be treated on an outpatient basis, while more serious injuries require surgical treatment. The authors Navarro-Monzonis A., Benito-Ruiz J. share their experience in treating these burns. 123 clinical records of patients admitted to hospital between 1983 and 1990 were reviewed. The most frequent victims are male teenagers, who mostly get into accidents on the street. The most serious burns followed accidents at work, with fatal outcomes in 47% of patients. Serious burns usually affect deep skin areas or burns that cover the entire thickness of the skin. A common pattern affects the groin, genitals, hypogastrium, and hands and occurs when fireworks light up in the patient's trouser pockets. The treatment of these lesions is no different from burns caused by other agents.

Rutenburg D. G. et al. (2011) in their research work touched upon the role of social factors, domestic and occupational injuries in the formation of purulent inflammation of the hand. They studied the epidemiological and clinical features of the manifestation and course of OHPC on the example of 660 (65% of men and 35% of women) patient case histories. Again, we observe a greater prevalence of cases of purulent lesions of the hand in men, which is associated with their professional features of work. The demographic structure is presented as follows: 13% are workers, 28% are employees, 30% are unemployed, 4% are employees of the administrative apparatus, 6% are students, 6% are pensioners, and 11% are disabled. In the age aspect, the frequency of occurrence of GVZK occurs between the ages of 20 and 60 years. The resulting structure indicates that this disease is characteristic of men of working age in such professions as a worker or employee.

The causal structure of the disease provided by the authors is also noteworthy. In 68% of all visits to surgeons in the anamnesis, violations of the skin of the hand were noted (cuts, bruises, bites, injections with various sharp objects, injection injections, burns and chopped wounds, after non-sterile hirudotherapy), receiving microtraumas through which a purulent infection penetrated. There are few cases of purulent inflammation due to the growth of a boil or other chronic foci of infection and the hematogenic path of microbial penetration.

Also, in this research work, an analysis was carried out from the point of view of the influence of the minimum level of sanitary culture and medical knowledge on first aid and skills on the ability to treat wounds on the period of access to professional medical care. The largest number of patients sought professional medical help only on the 4th day after the onset of the disease. Almost 58% of those who took the time to go to the doctor, were confident in the possibility of self-treatment. They used Vishnevsky's ointment, potassium permanganate, a concentrated solution of table salt, ichthyol ointment, Methyluracil and Levomekolointments for this purpose. Such behavior of potential patients naturally led to a complicated course of purulent-inflammatory diseases of the hand and fingers, which affected the duration of treatment and, in some cases, to manifestations of functional and cosmetic defects of the hands.

As you can see, the authors of the study note первопричинныйthe root cause of the acute advanced form of the disease, which is associated with hospital visits in most cases after the ineffectiveness of self-treatment.

*Research objective*

Improving the results of treatment of patients with purulent surgical diseases of the hand by applying an abacterial medium in outpatient settings.

**Materials and methods:** To create a reasonable picture of the selected methods and algorithm of surgical therapy, we analyzed the data of examination and treatment of 148 patients with GVHD of various etiologies who were treated on an outpatient basis in the family polyclinic of the Bukhara City Medical Association for the period 2016-2020.

Patients of the first comparison group underwent an emergency operation to open the purulent focus

and sanitize the purulent cavity with an antiseptic 3% solution of hydrogen peroxide on the day of treatment. After drying, sanitation was performed with a chemical solutionof 25% dimethyl sulfoxide, followed by the application of levomekol ointment and aseptic gauze bandages witha 25% dimethyl sulfoxidesolution. The bandages were changed daily once a day during systemic antibiotic therapy. antibiotics were selected based on their sensitivity to the wound microflora.

Group II patients underwent emergency surgery to open the purulent focus and sanitize the purulent cavity with antiseptic 3% hydrogen peroxide solution on the day of treatment. After drying, sanitation was performed with a chemical solutionof 25% dimethyl sulfoxide, followed by an abacterial mediumusing a25% dimethyl sulfoxidesolution. The abacterial environment was createdusing asterile rubber surgical glove, while the size of the glove was selected 2 times larger than the patient's hand. The lumen of the glove was filledwith a 25% dimethyl sulfoxide solution up to the upper border of the fingers, and then the affected patient's hand was immersed there. The upper part of the glove was hermetically fixed to the lower part of the forearm with a fixing material. To prepare a 25% concentration of pharmaceutical solution, dimethyl sulfoxide was diluted in a 1:3 combination with a sterile 0.9% sodium chloride solution. Immediately after surgical treatment of the acute purulent disease, sanitationwas performed with a 25% solution of dimethyl sulfoxide and gauze napkins moistened with the same solution were applied to the wound surface. After performing all these steps, the wound was tamponed with the same gauze cloth witha 25% dimethyl sulfoxidesolution. The top was fixed with aseptic gauze bandages once a day.

**Results:** All patients underwent an operation to open the purulent focus on the day of emergency treatment after the first premedication. The purulent cavity was sanitized with an antiseptic 3% solution of hydrogen peroxide, and levomekol ointment was applied under aseptic gauze bandages witha 25% solution of dimethyl sulfoxide daily 1 time a day, upon completion of the main actions for the treatment of purulent wounds and systemic antibiotic therapy, taking into account the sensitivity of the wound microflora. More than 60% of surgical procedures were performed under local anesthesia.

It should be noted that the subsequent treatment tactics of patients with both purulent inflammatory diseases of the fingers and purulent diseases of the hand were identical.

It should be noted that, taking into account the pathogenetic features of the disease, patients with concomitant diabetes mellitus were not included in the study.

Thus, the results of our study of the first control group of patients revealed the following: with the traditional method of treatment with a local application of 25% dimethyl sulfoxide solution and levomecol ointment, the intoxication indicators of patients with purulent finger diseases (And subgroups of the First comparison group) were normalized only for 7-8 days, the time of infection clearance by 5 days, infiltrate resorption by 3, the appearance of granulation 6, epithelialization were noted only by the 8th day of treatment. The results of these indicators in patients of subgroup B of group I of comparison, which included 33 patients with purulent diseases of the hand, showed the following features : all indicators of intoxication on the day of treatment were significantly higher than in patients of subgroup A of group I of comparison. During treatment, the dynamics of all indicators, local and general criteria for assessing the purulent process, were similar. However, it should be noted that the time of normalization of indicators in patients with B of subgroup I of the comparison group was on average 3-4 days behind, which also reflected the duration of outpatient treatment. We were not satisfied with this outcome of treatment, so we decided to improve the known methods of local treatment of purulent diseases of the fingers and hand using a local abacterial environment in order to improve this contingent of patients, which will be discussed in the next chapter of our work.

**Conclusion:** - the use of an abacterial medium with a 25% dimethyl sulfoxide solution accelerates both the removal of infection and the relief of inflammatory signs of the wound, which improves the results of treatment of purulent wounds of the fingers and hand, which will lead to the desired result. Accordingly, a study was conducted, the purpose of which was to apply local application of an abacterial medium using a dimethyl sulfoxide solution in the traditional treatment of purulent woundsдиметилсульфоксида.

A search for literature data on the topical application of dimethyl sulfoxide solution as an abacterial medium in the treatment of purulent wounds yielded scant information. There is no

pathogenetically justified scheme for the use of dimethyl sulfoxide solution in the form of an abacterial medium in the treatment of purulent wounds, depending on the phase of the wound process. There is insufficient information on the topical application of abacterial media in the treatment of GVHD and fingers.

The unresolved nature of these issues determined the purpose of the study, which analyzed the results of treatment of 148 patients with GVHD and fingers with different etiologies. Taking into account the differences in pathogenetic characteristics and severity of purulent-surgical diseases, the examined patients were conditionally divided into two groups: the comparison group consisted of 78 patients with GVHD and more. The second main group included 70 patients with GVHD and diseases of various etiologies.

In accordance with the objectives of the study, taking into account the anatomical location and severity of the pathological process, all patients of groups I and II were conditionally divided into 2 subgroups: subgroup A - purulent surgical diseases of the fingers, subgroup B - purulent surgical diseases of the hand.

Patients of the control I – comparison group after sanation with antiseptic 3%ным hydrogen peroxide solution, 0.02% furacilin solution and necrectomy for local treatment were applied a gauze dressing with Levomekol ointment on a water-soluble basis after treatment with 25% dimethyl sulfoxidesolution. Systemic antibiotic therapy was performed, taking into account the sensitivity of microflora isolated from wounds, detoxification therapy, and symptomatic treatment.

In Group II patients (n=70), the above treatment was supplemented with the subsequent use of an abacterial medium witha 25% dimethyl sulfoxide solution for 8 hours once a day.

Objective assessment of the state of the wound process, these indicators of its general and local manifestations was carried out by subjective indicators (the content and nature of wound discharge, the rate of infiltrate resorption, the state of wound edges, the state of granulation tissue and epithelialization) and by objective signs of patients (body temperature, general clinical blood test, leukocyte intoxication index, concentration of medium-molecular peptides in serum pH of the wound discharge, calculation of the prognostic coefficient (PC) according to M. F. Mazurik, percentage of reduction of the wound surface area, wound healing rate, bacteriological and cytological studies).

Analysis of the results of studies of patients in group I revealed insufficiently satisfactory indicators of the main criteria for assessing the dynamics of the wound process. Thus, patients with purulent wounds of the first comparison group showed a rather late cleaning of the wound from infection (only by the 4th day of treatment); the onset of granulation by the 6th-7th day of treatment: the onset of epithelialization by the 8th-9th day of treatment leaves much to be desired; the biochemical parameters of wound exudate reach the norm only bym days of treatment; the average duration of treatment is 11.5±0.7 days. marked only by day 10. All this indicated the need for additional measures aimed at improving the results of treatment.

For this purpose, in the complex treatment of the following groups of patients with purulent wounds, it was decided to apply locally an abacterial medium using a solution of dimethyl sulfoxide in 25% concentration.

A comparative analysis of the indicators of intoxication of the body in the examined patients of subgroups A (I) and A(II) revealed:

- the use of a local 25% dimethyl sulfoxide solution on the wound in the form of an abacterial medium in the complex treatment of patients with purulent surgical diseases of fingers A (II) led to complete purification of wounds from infection after two days of treatment(3±0.2 days). The intracranial infiltrate began to resolve on day 2 (2±0.2 days). The onset of granulation was observed by the 5th day of treatment (5±0.5), and epithelization by the 6th day of treatment (6.5±0.4 days). All these parameters were significantly ahead by 2±0.5 days in A subgroup II of the main group of patients than in A subgroup I of the comparison group.

The results of subgroup A (I) and A (II) showed that the inclusion of topical applicationof a 25% dimethyl sulfoxide solution in the form of an abacterial medium on purulent finger diseases in the treatment of purulent surgical finger diseases contributed to the acceleration of wound cleansing, improvement of biochemical and cytological parameters of wound exudate. This dynamics contributed to a reduction in the time of transition of the wound lesion from the stage of

inflammation to the stage of regeneration by 1.5±2.0 days.
In general, the period of outpatient treatment was reduced by 3.2±0.3 days in comparison with the same data in patients of the comparison group A (I).
Based on the objectives of the study, the next stage of work was aimed at studying the effect of the local abacterial environment on the healing process of purulent wounds of the hand. For this purpose, an abacterial medium with диметилсульфоксидаа 25% dimethyl sulfoxide solution was used, the method of which is described in detail in chapter II of the paper.
A comparative analysis of the indicators of intoxication of the examined patients of subgroup B (I) and B (II) revealed the following:: in patients B of subgroup I of the comparison group, in which the abacterial medium was not used, intoxication indicators normalized by 10±0.6 days, and in patients who included the abacterial medium in the treatment package in subgroup II of the comparison group, these indicators normalized by 7±0.4 days of treatment.
When using a local abacterial medium in the complex treatment of patients with GVWK, complete purification of the wound from infection was noted after one day of treatment (2±0.4). The intracranial infiltrate began to resolve on day 2 ( 2±0.3 days). Granulation appeared after two days of treatment (3±0.5 days), and epithelialization – after four days of treatment (5.3±0.3 days). A comparative analysis of these parameters in patients of subgroups B (I) and B (II) revealed a significant advance in the time of wound cleaning and healing in patients of subgroup B of group II of the comparison group by 2.5±0.5 days compared to the comparison group.
The obtained results of the conducted studies make it possible to recommend the widespread use of a local abacterial medium with a 25% dimethyl sulfoxide solution in the treatment of purulent inflammatory surgical diseases of the fingers and hand in outpatient settings according to the developed method.

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