

ORIGINAL PAPERS

EVALUATING THE EFFECTIVENESS OF ANTISEPTIC SOLUTION DECASAN IN TREATMENT OF NECROTIC SOFT TISSUE DISEASES

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Sepsis is a severe generalised infection caused usually by pathogenic bacteria. It is often the cause of hospitalization and death in patients treated in intensive care and other hospital wards. Latest research brought to better understanding of pathomechanisms, took place significant development of therapy heading to improvement of general patients condition treated as a basis and additionally supported by local therapy.

The aim of the study was to evaluate the possibility of using the solution Decasan in the comprehensive treatment of patients necrosis of soft tissues.

Material and methods. The study included 192 patients (W/M 103/89; average -aged 53.35 ± 5.36 years). According to the classification of septic states (Chicago, 1991), patients were divided into three groups: first – patients to the local form of the infection, the second – with Systemic Inflammatory Response Syndrome (SIRS), which lasted up to 72 hours and the third – patients with various forms of sepsis, SIRS in which lasted 72 hours.

Results. As a result of our studies carried out in patients where the wound was made decontamination solution Decasanu, received: pain reduction, decrease tissue swelling, early debridement of the wound and the appearance in the wound granulation, to reduce delays wound healing. Proposed algorithms treatment of various forms of sepsis, pointed out the essential elements, i.e.: a comprehensive approach to the treatment of infection by early surgical intervention, intensive supportive therapy (fluid resuscitation), antibiotic therapy directed to microorganisms that cause infections and topical antiseptics therapy (solution Decasanu).

Conclusions. The preparation antiseptic Decasan can be safely used for disinfection of skin, mucous membranes and wounds in the foci of infections caused by bacteria, fungi and protozoa.

Key words: necrosis of soft tissues, sepsis, antiseptics, Decasan

Rapid development of medical technologies inaugurated new epoch in medicine, but did not solve all problems. Sepsis is not so widespread among diseases as infarction or stroke, however, billions are spent on the treatment of this disease in any system of health care. Incidence of sepsis in developed countries constitutes 50-100 cases per 100,000 of the

population. Lethal cases due to sepsis constitute 20%, due to severe sepsis – 32-40%, due to septic shock – over 70%. Incidence of detection of Gram-negative and Gram-positive sepsis, in most pyo-septic centers and general hospitals nowadays is approximately similar, but tendency to increase in the latter appears. Issues of diagnostics and treatment of patients

with Gram(-) and Gram(+) sepsis remain an object of multiple discussions, but they have not been studied completely and are not widely known to many practitioners. Thus, profound study of pathophysiological processes in patients with Gram(-) and Gram(+) sepsis implies elaboration of new directions in treatment and improvement of results, which has an important medical, social and economic meaning.

The aim of the study was to evaluate expediency of Decasan solution in complex treatment of patients with necrotic diseases of soft tissues (NDST).

MATERIAL AND METHODS

Clinical material included 192 patients with NDST. Investigation was conducted from March 2014 to July 2015.

According to modern classification of septic conditions, suggested in Chicago in 1991, two forms of infection are clinically differentiated: local and generalized. By this principle, patients were divided into 3 groups. The first group comprised 96 (50%) patients with local form of infection, the second group – 46 (24%) patients with the syndrome of compensated systemic inflammatory reaction (SCSIR), which lasted less than 72 hours after debridement of purulent focus. The third group included 50 (26%) patients with various forms of sepsis, in which SCSIR lasted more than 72 hours after opening of purulent focus. Signs of multiple organ failure or disorders of hemodynamics were observed.

Investigation of indices of total blood count, comparison of the level and dynamics of markers of acute inflammation phase, and bacterial investigation were performed to confirm diagnosis and differential diagnostics of local and generalized form of infection.

Complex treatment for this category of patients was based on surgery, rational antibac-

terial and disinfecting therapy. Local wound debridement included use of 0.02% Decasan and 0.5% chlorhexidine bigluconate.

RESULTS

Among in patients, the majority were with sepsis signs of various degrees of severity. Specifying investigated groups of patients, it may be stated that the obtained mean indices of clinical-laboratory data in combination with other symptoms indicate presence of systemic inflammation. Investigation of clinical and laboratory parameters was conducted for determination of the structure of generalized systemic inflammation in patients (tab. 1). A reliable rise in intoxication indices: concentration of leukocytes, growth of criteria of systemic inflammatory reaction (tachycardia, tachypnea, fever) was observed in increased deterioration of systemic inflammation.

Considering high probability of influence of long-term presence of primary focus of infection and peculiarities of local inflammatory reactions of tissues to the development of various forms and clinical variations of infection, we have analyzed these indices in patients with various forms of soft tissue infections. Average terms of outpatient treatment for local form of infection were 5.2 ± 0.091 days, for the syndrome of compensated systemic response 6.8 ± 0.22 days, and for different forms of sepsis 10.4 ± 0.123 days. Thus, it can be seen that if focus of infection lasts more than 5-6 days, it acquires septic properties, which defines the development of generalized form of infection.

By the character of inflammatory reaction, limited inflammatory process was observed in 68 (70.83%) of patients with local form of infection, and phlegmons of soft tissues were seen in 27 (58.7%) of patients with the syndrome of compensated systemic response and 10 (20%) of patients with various forms of sepsis

Table 1. Clinical-laboratory data of patients depending on the degree of systemic inflammatory process

Indices	Group 1	Group 2	Group 3
Heart rate	92,35±13,52	103,85±13,1	110,08±25,7
Respiratory rate	20,15±2,85	21,1±2,3	23,3±3,5
Temperature	37,8±0,76	37,9±0,78	38,3±0,75
WBC	8,25±1,05	11,53±0,92	12,9±1,25

($p < 0.05$). Purulent nature of inflammation was observed in 87 (90.6%) of patients with local infection and in 41 (89.1%) of patients with the syndrome of compensated systemic response, and necrotic alterations of tissues were detected in 15 (30%) of individuals ($p < 0.05$). Concomitant diabetes mellitus, as well as pathology of arteries and veins in the lower extremities influenced the nature of inflammatory reaction and course of wound process. Diabetes mellitus accompanied soft tissue infections in local form in 3.9% of cases, and in generalized infection in 10.7% (syndrome of compensated systemic response) and 11.8% (sepsis) of cases.

Analyzing results of surgical treatment of this group of patients, it was detected that in various forms of sepsis, severity of a patient's condition and necessity of conducting urgent detoxification and correction of impaired organ functions enabled to perform primary debridement of focus in purulent infection in 7.4 ± 0.07 hours, and in pyo-necrotic lesions – in 5.3 ± 0.08 after admission to hospital. In local form of infection and SCSIR, primary debridement was performed in purulent processes in 2.6 ± 0.03 i 4.7 ± 0.08 hours, respectively, while in necrotic alterations of tissues – in 2.8 ± 0.04 and 3.5 ± 0.05 days after admission. Some patients were subjected to repeated scheduled and compulsory surgeries for adequate debridement of the focus of infection. In purulent inflammation, repeated surgeries had compulsory nature and were performed in 1.3% of patients with local infection, in 1.2% of patients with SCSIR and in 28% of patients with various forms of sepsis.

High percentage of repeated surgeries in various forms of sepsis was caused not only by the absence of adequate level of debridement of the focus of inflammation during primary surgery, but quite often was detected by independent course and uncontrolled systemic inflammatory reaction. In this situation, repeated surgeries were one of the methods of differential diagnostics among persistent focus of bacterial invasion and varieties of generalized form of infection. Besides, wound process in sepsis differs by slow course and long-term persistence of inflammatory reaction of the tissues, requiring performance of multi-step surgeries. In patients with SCSIR without signs of organ and system dysfunction, surgeries should be performed as soon as possible

after admission to hospital (first 2-4 hours in purulent and not more than 3-4 days in necrotic infections), which increases probability of SCSIR relief in the first 72 hours and decreases the risk of sepsis development.

Surgeries in different forms of sepsis should be ultimately short-term, but maximal debridement of foci of bacterial invasion should be achieved. In the absence of clinical effect after primary debridement of the focus of bacterial invasion and reliable signs of the progress of local inflammatory alterations in tissues, dynamics of laboratory indices should be evaluated first, presence of secondary foci of infection should be excluded, and detoxifying therapy should be performed. Repeated surgery in the region of the focus should be performed only in stable absence of a body's positive reaction during 12-24 hours. Such requirement is explained by the fact that in sepsis, general reactions of the body lose connection with local inflammatory process, and any additional trauma to the soft tissues in the area of septic focus, as a rule, increases its margins and provokes further entering of pro-inflammatory factors into the blood, supporting the chain of systemic pathophysiological reactions.

In bacterial investigations, 268 etiologically significant strains of microorganisms were isolated. In the culture medium of agents, Gram(+) flora prevailed – 52.9% cases, in which *Staphylococcus aureus* constituted 46.8% of cases. Streptococci were inoculated in 9.7%. High incidence of inoculation of streptococci is explained by a large number of patients with complicated forms of erysipelas. Enterococci constituted 6.4% of observations. The last circumstance causes concern, since sensitivity of the latter was only to carbapenems. Inoculation of Gram-negative bacteria constituted 37.1%, in the structure of which prevailed *Pseudomonas aeruginosa* – 17.7% and *Escherichia coli* – 11.3%. Inoculation of *Proteus* constituted 6.4% of cases, other agents – 1.6%. It should be mentioned, that mixed flora was seen in 25.8% of observations.

In the process of search for effective method of post-surgical management of wound process among patients with primary and secondary necrotic lesions of the soft tissues, all patients were operated for opening of bacterial focus, adequate antibacterial therapy was conducted depending on the isolated agent; detoxifying

therapy was performed for patients with severe sepsis. The basic groups of medications for local treatment of pyo-necrotic diseases are antiseptics, ointments with polyethylene glycol, new biologically active dressing means. Application of local antiseptics is an indispensable part of the process of purulent wound treatment. Among antiseptics, medications with universal, wide spectrum of action, active against mixed microflora, are preferred. In contemporary medicine, surfactant species are used more often than other antiseptics. Depending on chemical properties of surfactant species, they are divided into 2 basic groups – ionogenic and nonionic. Among wide choice of antiseptic medications, ionogenic surfactant species gain more importance in clinical practice. A typical representative is decametoxyn. Decasan is a series medication, manufactured at pharmaceutical company “Yuria-Farm” (Ukraine), registration № UA/5364/01/01 dated 03.01.2012. The medication is a transparent, colorless substance with the composition: decametoxyn (per dry substance) – 0.2 g, sodium chloride – 9 g, water for injections – to 1 L.

Antimicrobial action of investigated medications on polyresistant clinical strains of bacteria and *C. albicans* is presented in tab. 2.

As a result of conducted investigation, it was established that among conditionally pathogenic microorganisms, clinical strains *P. aeruginosa* had a significantly lower sensitivity to antiseptic medications. It was established in the experiment that considerably higher concentrations of antiseptics are required to achieve bactericidal action. Effective action against *P. aeruginosa* was observed in decasan (MBC – 80 ± 4.2 mcg/ml), lower anti-

microbial action against *P. aeruginosa* was seen in chlorhexidine bigluconate (MBC – 142.86 ± 11.62 mcg/ml) ($p < 0.001$). Evaluation of antimicrobial properties of antiseptics proves that decasan and chlorhexidine bigluconate have an effective action on antibiotic-resistant strains *S. aureus*, *Enterococcus* spp. Decasan shows high antimicrobial action on *E. Coli* compared to chlorhexidine bigluconate. Decasan shows effective bactericidal influence on antibiotic-resistant strains *Enterobacter* spp., *K. pneumoniae*, *A. baumannii*, *P. aeruginosa*, *Proteus* spp. and is preferred to chlorhexidine bigluconate in 1.5-3.8 times by the action concerning these agents.

In the process of complex clinical and laboratory investigations of patients, who had been done debridement of purulent wounds with solution Decasan, pain syndrome in the 1st group lasted 2 days (from 12 hours to the 2nd day), in the 2nd – 5 days (from 2 to 6 days), in the 3rd – 6 days (from 3 to 7 days). Swelling of tissues in patients of the 1st group persisted 2 days (from 2 to 3 days), 2nd group – 4 days (from 2 to 5 days), in the 3rd group – 6 days (from 3 to 7 days). Complete clearing of wounds in patients of the 1st group occurred on the 3rd day (from 2 to 3 days), in the 2nd group – on the 5th day (from 5 to 6 days), in the 3rd group – on the 7th day (from 5 to 8 days). Active filling of wound surface with granulations occurred on the 5th day (from 5 to 6 days) in patients of the 1st group, in the 2nd group – on 9th day (from 7 to 10 days), in the 3rd group – on the 12th day (from 8 to 13 days). Wound healing in patients of the 1st group occurred on the 16th day (from 16 to 17 days), in the 2nd group – on 19.29 ± 2.35 day, in the 3rd – on 22 ± 1.54 day.

Table 2. Minimal bactericidal/fungicidal concentrations of remedies for test-strains, mkg/ml (M± m)

Microorganism (n)	Decasan	Chlorhexidine bigluconate
<i>S. aureus</i>	4,31±0,48	13,65±1,01*
<i>Enterococcus</i> spp.	4,45±0,38	21,37±1,91*
<i>E. coli</i>	9,43±0,49	21,49±1,57*
<i>Enterobacter</i> spp.	18,75±2,08	32,03±4,11**
<i>Proteus</i> spp.	84,38±5,98	156,25±17,12*
<i>K. pneumoniae</i>	20,83±1,78	42,32±5,48*
<i>A. baumannii</i>	31,79±2,19	73,34±5,93*
<i>P. aeruginosa</i>	80±4,2	142,86±11,62*
<i>C. albicans</i>	13,82±0,88	19,71±1,58**

Note: * $p < 0.001$ – compared to Decasan; ** $p < 0.01$ – compared to Decasan.

DISCUSSION

The tested preparation is considered to be effective, as it reduces the number of living bacterial cells in the solution by 5 logarithmic units, which corresponds to a reduction of living cells in the solution by 99%. The test results obtained demonstrated that all mucus-producing bacteria strains, isolated from the infected operated tissue, were effectively eliminated by the antiseptic preparation applied. Decasan antiseptic preparation, under test conditions, demonstrated strong bactericidal properties against strains of mucus-producing bacteria. It reduced, in the time specified by the manufacturer, the number of living cells in the suspension by 99%, and is compliant with requirements set forth in the standard relating to antiseptic substances

designed to disinfect skin and mucous membranes, with respect to the bacteria tested. The action of Decasan antiseptic preparation, which is composed of: Decametoxin, Natrium chloride and auxiliary substances, was, under the examination conditions, similar in regards to all tested species of bacteria.

CONCLUSIONS

Early debridement of pyo-necrotic focus, as well as post-surgical debridement of wounds with solution Decasan accelerates eradication of pathogenic wound flora, transition of inflammation phase to regeneration phase, enables to relieve SCSIR in the first 72 hours, decreases risk of sepsis development, decreases periods of hospital stay.

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