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USE OF OZONE IN THE TREATMENT OF BURN SEPSIS

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Annotation. Burns represent a serious medical, social and economic problem. Improving the methods of treatment of victims of thermal injury led to a decrease in the incidence of sepsis, one of the most formidable and dangerous complications of burn disease, improved the results of specialized care for patients with extensive burns. Nevertheless, the infection still remains the main cause of complications of burn disease and death of burned people. At the same time, the lethality of severely burned patients remains high even in specialized hospitals. Sepsis continues to carry a deadly risk, and this cannot be reconciled.

For successful prevention and treatment of burn sepsis, early clinical and laboratory diagnosis and intensive complex measures are required, including active surgical tactics aimed at timely restoration of the integrity of the skin, adequate antibacterial and immunotherapy in combination with the treatment of burned patients with parenteral ozone therapy.

Key words. Burn, burn sepsis, surgical tactics, ozone therapy.

INTRODUCTION. The problem of thermal injuries occupies one of the central places in surgery and traumatology. Currently, the frequency of burns in developed countries reaches 1:1000 population per year, and the mortality rate from burns ranges from 1.5 to 5.9% [1,3].

The problem of diagnosis and treatment of generalized infection in severely burned patients , which consistently ranks first among possible causes of death in patients with extensive burns, remains relevant, since the mortality rate from burn sepsis, according to various authors, ranges from 23 to 82% [2,4].

Sepsis and septic shock are major public health problems. They cause over a million deaths worldwide each year, with a fatality rate of approximately one in four cases. Sepsis is the leading cause of death in non-coronary intensive care units and ranks 11th among all causes of death in the population [6].

Extensive burn damage is accompanied by the development of a whole complex of changes in the body of the victims, called burn disease. Infection plays a leading role in the pathogenesis of burn disease. At the same time, the infectious process that

begins in the burn wound tends to generalize and often leads to such a severe complication as sepsis [5,11,14].

Thus, the pathogenesis of burn sepsis is extremely complex and depends on numerous factors and their combinations. Only an assessment of changes in the body of a burnt person based on constant dynamic observation allows us to predict and diagnose sepsis, and to build an effective scheme for complex pathogenetic treatment of this complication [12,15].

The development of various ozone therapy methods, the creation of safe devices for the production of medical ozone with a precisely controlled concentration, and a large number of experimental studies have made it possible to find some new, pathogenetically substantiated methods for treating life-threatening conditions in thermal injuries. The following positive qualities of medical ozone are used to treat emergency conditions in thermal injuries. It has bactericidal, analgesic properties, improves microcirculation , normalizes immunity, oxidant-antioxidant state of blood and cells [7,10].

Ozone therapy is mainly used. The positive effect of parenteral ozone on the victim's body is manifested, first of all, in the correction of disturbances in oxygen delivery and its consumption by tissues (in strengthening the oxygen-transport function of the blood, etc.), in the regulation of humoral immunity, improvement of the rheological properties of the blood, normalization of microcirculation, excessive hypercoagulation, reduction of platelet aggregation, reduction of fibrinolysis, normalization of lipid peroxidation processes, and in the analgesic effect [8,9].

The aim of the study was to investigate the effect of ozone therapy in the complex treatment of burn sepsis.

Materials and methods of the study. To achieve the goal and objectives of the study, data were used from a total of 130 victims with thermal injury who were treated in the Combustiology Department of the Samarkand branch of the Russian Scientific Center for Emergency Medicine from 2020 to 2023. In the first subgroup , consisting of 50 patients (the main II subgroup), treatment of burn sepsis was carried out using a traditional complex technique, and a course of ozone therapy was used for 10 days; ozonized physiological solution (OSS) with a saturating concentration of 4.0 mg/l was administered in a volume of 200 ml once a day by intravenous drip. In the II subgroup (main II subgroup), consisting of 30 patients, complex pathogenetic therapy of burn sepsis was carried out without intravenous ozone therapy. In the 1st subgroup (subgroup 1 control), 30 burn victims received traditional complex treatment in combination with ozone therapy , in whom burn sepsis was not detected. And finally,

in the second subgroup of patients (control group), consisting of 20 patients, burn disease was treated using well-known traditional methods (without ozone therapy).

Enough high efficiency ozone therapy in clinical established in practice in a number of pathological processes and diseases: disorders main peripheral blood circulation, acute blood loss, in oncology, cardiac surgery , in diseases top respiratory tract and lungs, viral infections, in infections sexual systems, in surgery - for treatment peritonitis, pancreatitis, cholecystitis and cholangitis, osteomyelitis, purulent wounds and trophic ulcers. The use of ozone in combustiological practice has not been sufficiently studied; the effect of ozone on regenerative processes in burn victims with burn sepsis is unknown.

Burn sepsis was confirmed clinically and laboratory (PCT - procalcitonin test, CRP - C-reactive protein) and bacteriological examination in 80 (61.5%) patients. All patients received treatment appropriate to the severity of OB, including, in the case of sepsis, its standard therapy.

Results of the study. In 50 (38.5%) burn victims, aged 42.75±2.51 years with the Frank index of 108.87±2.55 conventional units and signs of burn sepsis, IVVOFR (intravenous ozonized saline solution) was administered in a volume of 200 ml at 11.54±2.11 days after the burn, with an ozone concentration in the liquid of 4.0 mg/l, once a day for 10 days (main subgroup I - sepsis with ozone).

Victims aged 43.3±3.75 years with a Frank index of 105.75±3.54 conventional units and signs of burn sepsis were treated without intravenous irradiation (main subgroup II – sepsis without ozone).

30 (23.0%) burn victims, aged 47.85±3.95 years, with a Frank index of 98.54±2.11 conventional units with a risk of developing burn sepsis, also began VVVOFR for a period of 9.71±2.85 days after the burn using the same method as the main group (control group I subgroup - without sepsis with ozone).

20 (15.5%) burnt patients aged 38.85±6.3 years with a Frank index of 90±9.5 conventional units without signs of sepsis were treated without ozone (control group II subgroup – without sepsis without ozone).

In all groups, the indices of the blood antioxidant system were studied for 5 days. Blood was examined from the central vein 1 hour before administration, one, six and 24 hours after administration of the ozonized solution. The study of the blood antioxidant system included determination of catalase and reduced glutathione indices in plasma.

Ozone therapy in subgroup I of the control group (without sepsis with ozone) led to normalization of the slightly elevated level of catalase, while in subgroup II of the control group (without sepsis without ozone) this normalization was not observed. In subgroup I of the main group (sepsis with ozone), starting from the 2nd–3rd day, ozone therapy led to a persistent increase in the reduced level of catalase, with a residual

increase at the end of the week, while in subgroup II of the main group (sepsis without ozone) this was not observed — the catalase level remained extremely low.

The use of ozone in subgroup I of the control group (without sepsis with ozone) resulted in a 1.2–1.5-fold increase in the reduced (4-fold compared to the control) level of reduced glutathione , and in 33% of cases even before its normalization, and in subgroup II of the control group (without sepsis without ozone), its level gradually decreased throughout the entire treatment and examination period. The use of ozone in subgroup I of the main group (sepsis with ozone) resulted in an insignificant increase in the level of reduced glutathione immediately after the start of ozone therapy, but without its normalization at the end of the week, and in subgroup II of the main group (sepsis without ozone), its level remained critically low throughout the entire treatment and examination period.

Changes in the indicators of the body's antioxidant system in severe burn disease should be considered as a compensatory-adaptive mechanism aimed at limiting significant destruction in the burn wound. In the case of burn sepsis with severe, in this case multiple organ failure, the liver parenchyma becomes incapable of synthesizing reduced glutathione and other factors of the antioxidant defense system corresponding to the pathological condition .

Thus, the following urgent indications for parenteral ozone therapy in combustiology can be formulated:

1. In the treatment of burn shock (parenteral ozone therapy) against the background of calculated and individualized anti-shock therapy.

2. To correct immune parameters in the treatment of acute burn toxemia and burn septicotoxemia .

3. For the correction of endogenous intoxication syndrome and multiple organ failure.

4. For intensive care of critical conditions - burn sepsis.

In conclusion, it should be noted that:

1. Ozone therapy has a certain number of indications for parenteral use in the treatment of emergency conditions in combustiology - severe burn shock and acute burn toxemia.

2. Intravenous ozone therapy leads to significant positive changes in the antioxidant system, which is disrupted in severe burns complicated by burn sepsis.

Thus, the data obtained by us indicate a pronounced positive effect of parenteral ozone therapy on the course of the septic process in patients with burn sepsis. This allows us to recommend the inclusion of ozone therapy in the list of necessary drugs for the complex therapy of sepsis in severely burned patients .

Conclusion. Ozone therapy resulted in significantly earlier cleansing of burn wounds, reduction of purulent discharge, microbial contamination, according to

bacteriological studies (CFU <10 ^{7} -10 ^{4} to 10 ^{3} -10 ^{2}) in 34 (68.0%) patients of the control group, various complications were noted .

A comparative analysis showed that the developed and implemented principles of intensive complex therapy for burn sepsis and rational surgical tactics in patients with deep burns contributed to a decrease in overall mortality in the second period (2020-2023) compared to the first (2016-2019) - from 72.5% to 45%.

Thus, the use of ozone therapy leads to a reduction in the number of complications and fatal outcomes in patients with burn sepsis.

Ozone therapy is a simple and inexpensive method of treatment, which leads to a reduction in treatment and hospital days and provides a significant economic effect.

Ozone therapy is an effective method of treating burn sepsis, due to the polyvalent therapeutic effect of ozone on the body, the availability and low cost of equipment, as well as the ease of use in everyday combustiological practice. Parenteral ozone therapy leads to significant positive changes in SIRS (systemic inflammatory response syndrome), biochemical blood parameters, an increase in protein levels, a decrease in blood clotting, a decrease in microbial contamination of burn wounds, and also activates the body's own enu antioxidant system, which is disrupted in severe burns complicated by burn sepsis.

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