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*V.V. Chepenko, A.O. Kucherik, M.V. Donets
(The City of Vladimir, Vladimirskaya Regional Clinical
Hospital, VPGU)*

**Evaluation of Vibroacoustic Effect on Intensive Care
Patients Using Nonlinear Dynamics Methods.**

Nowadays, septic complications of various illnesses present the largest lethal rate in intensive care units. Lethality is mainly related to multiple organ failure (MOF). Sepsis is a dynamic process and can be accompanied by a growing generalized inflammation and the development of organ dysfunction (A.A. Alexeev, B.R. Gelfand, I.A. Erokhin. Surgery. 2002. Supplement No. 1. p10).

In the treatment of septic complications an emphasis is placed on restoration of normal fluid distribution between sectors of the organism, i.e. intracellular, interstitial and vascular, as well as on the improvement of microcirculation and oxygen delivery to tissues (B.R. Gelfand, E.B. Gelfand. Surgery. 2002. Supplement No. 1. p12).

When dealing with therapeutic issues and choosing infusion drugs for sepsis, it is necessary to consider the multifactor nature of disorders caused by septic inflammatory response. Besides the loss of venous return and preload caused by vasodilation and sequestration of blood, the increased capillary permeability (capillary leak syndrome) leads to extravasation of both fluids and colloid blood components. Considering that one of the reasons for the loss of venous return, hemodynamic barrier reduction and, consequently, the increase in capillary permeability is the acid-base imbalance in blood,

we decided to supplement the traditional treatment with the vibroacoustic action on kidney area.

In order to evaluate the result of this action on patients' condition, we applied the nonlinear dynamics method using heartbeat gaps as a parameter. Nonlinear dynamics methods allow to calculate and graphically display the so called phase-plane portrait of dynamic systems, where their characteristic dimensions and form reflect energy characteristics of the system status, in our case - the patients' status.

The phase-plane portrait has been calculated using the Tankens method.

The survival probability was evaluated using the APACHE II (picture 2) and SOFA scales.

According to the above evaluation methods all patients had bad prognosis index. Tinting was done on 24 patients for 10-40 min daily using "Vita fon- IK" in mode 2 on point K.

The examination was carried out on 58 patients staying in the intensive care unit for 14-28 days with severe septic conditions (post-operative patients of abdominal cavity surgery, thoracic surgery etc.), sever neurologic pathology, (craniocerebral injury, brain tumor, various cerebral blood flow disorders).

In addition to traditional treatment, 28 patients were receiving vibroacoustic treatment on kidney area using "Vita fon- IK" on mode 2. The length of procedures was increased from 10 to 40 minutes, 10 minutes per each procedure, two procedures a day.

Examination of a phase-plane portrait before vibroacoustic exposure, during the process and after it shows considerable improvement in patients' status, which also correlated to the APACHE II evaluation.

The method of nonlinear dynamics allows to efficiently evaluate the direction of changes in patients' state and to timely adjust the treatment tactics. We displayed that the changes in phase-plane portraits in response to changes in treatment tactics happen sooner than any other registered changes in patients' state. As early as after the first vibroacoustic action on kidney area the changes in phase-plane portraits corresponded to the improved status of patients. It gave us grounds to continue vibroacoustic therapy and increase the length of procedures.

Research results: lethality in the control group was at 28%, and lethality in the group receiving additional vibroacoustic therapy – 16%. The groups of patients were comparable by the severity of the sickness.

Conclusion:

- inclusion of vibroacoustic therapy into the intensive care patients treatment complex increases their probability of survival.
- evaluation of the direction of changes in the patients' status using the method of nonlinear