Mathematisation of modern biology and medicine, the widespread use of statistical methods for processing experimental and clinical data, verifying the put forward hypotheses and grounding mathematical models of various phenomena and processes - all these are the characteristic features of the development of medical science. Insufficient amount of observations, significant index variability of parameters under study strongly impede carrying out mathematical processing and analysis of the obtained results due to various factors.

The aim of our work is to determine the adequate optimum methods of mathematical processing and analysis of complex treatment of patients with ischemic contracture of hand and foot and the evaluation of the effectiveness of the applied treatment.

Materials and methods: The results of treatment of 123 patients with ischemic contractures of the hand and 74 patients with ischemic contractures of the foot were used for processing and analysis. Functional and clinical conditions of limbs were assessed by the conventional parameters: lower limbs - function assessment was made in scores, the upper ones – according to the percentage of function loss. Efficiency evaluation of treatment was determined by the difference between primary (before treatment) and final (after treatment) indicators.

Since the objectives of the research, along with the assessment of treatment effectiveness also included identifying the key factors that influenced the effectiveness of treatment, processing and analysis of the results was carried out in several stages on each limb separately.

Proceeding from the results of our experimental studies, we previously attributed to the main influence factors the following: the level of severity of ischemia, the time – periods (stages) of posttraumatic processes and complexity (severity) of isolated or combined damage of limbs. According to the degree of severity of ischemia we distinguished between three levels: light, medium and hard; according to the stages: sharp, reactively-recovering, and residual. According to complexity of the injury we put forward 7 (6) groups: isolated bone (or joint) damage, musculoskeletal system damage (combined trauma of bones or joints with damage to tendons or muscles), injuries of the musculoskeletal system linked to nerve damage, musculoskeletal injury together with vascular injury, musculoskeletal trauma associated with both nerves and blood vessels, soft tissues damages and injuries with necrotic supplicative complications. While analyzing the results of treatment of lower limbs, we combined a group of isolated bone injuries with group of the musculoskeletal system traumas (the average group indices were almost identical). Determining the average indicators was made by the conventional methods. Measuring of the group averages was conducted both by pairwise group comparison, and by ANOVA method. To determine the links between the final results with the initial state we used the correlation analysis. The identity of medium differences of various groups was defined both by parametric Student-Fisher criterion and nonparametric criterion «U» (by Vilkokson-Mann Whitny).

Results. Integrated treatment of ischemic contractures of the hand and the foot is highly effective for improving functional status of injured limbs, especially
the lower ones, which final average indicators 2.5 times actually exceed the initial level of the lower limb function. The study of various factors influencing the effectiveness of treatment showed that in the treatment of upper and lower limbs the main factors of influence were: the severity of ischemia, the time-periods (stages) of posttraumatic process, complexity (intricacy) of combined injury.

The final result of recovery treatment depends greatly on the initial (before treatment) state of the lower limb; as for the upper limb, the correlation between the primary functional state with the endpoint indicators is rather weak and doesn’t have any significant impact on the effectiveness of treatment.

During the treatment of upper limbs, ischemia severity and the duration of posttraumatic process influence the effectiveness of treatment, but the probability of this dependence is not sufficient enough at three levels of severity and two periods of time (less than 95%). Only in reactive-recovery period the impact on the effectiveness of treatment, according to analysis of variance (ANOVA), is credible.