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Experimental Study of Surgical Patients' Status Severity Scoring Systems Use

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Abstract:

The efficacy of using individual systems estimating the severity of surgical patients' state (APACHE, APACHE II, MIP) has been studied in a comparative aspect by means of experimental modeling. Prognostic evaluation of the effectiveness of scoring pathologic conditions was studied by simulating an acute pathological process (peritonitis) in experiment. The application of such systems with a prognostic purpose is advisable for using under clinical conditions. It is expedient to combine different evaluation systems with the aim of enhancing prognostic reliability and optimizing the treatment tactics.

Key words: surgery, diagnostics, APACHE, APACHE II, MIP, abdominal sepsis, peritonitis.

Introduction

Practical experience shows that in many patients the clinical course of surgical diseases depends not only on local peculiarities of pathological process (locus morbi), for example the degree of peritoneal inflammation and damage of peritoneum in peritonitis, but also on many other factors associated with age, concomitant pathological changes, specific and nonspecific immune resistance, endocrine status, etc. Therefore, severity of status assessment standardization in

surgical patients using multimodal scoring systems that can more accurately and objectively determine treatment policy, the surgical tactics is urgent [4]. Today, there are many rating scales, and nomograms, which are often not consistent. Their scope is constantly expanding and currently covers the diagnosis, prognosis, treatment, and surveillance for many diseases and injuries.

Scaling or scoring system is usually based on a numerical evaluation of clinical, physiological, laboratory, and other parameters [3-5]. The presence of clinical symptoms or disorders of physiological, biochemical parameters compared to normal values are determined by the number and value regarding one patient includes in the overall scale. The resulting numerical value gives an estimation of some given properties of the pathological process of each patient. No doubt, this approach is the basis for individual surgical treatment.

Among of the scoring systems of the patient's condition severity (SSPCS), the largest distribution prevalence belongs to following [2, 4]: APACHE (Acute Physiology and Chronic Health Evaluation), APACHE II, APACHE III, PSS, MIP, SOFA, ASA. However, the question of necessity and usefulness of various score evaluation systems remains a subject of vivid debate, as numerous studies confirm that there are still no universal definitions and criteria.

The aim of the study is to determine the feasibility of using the most common scoring systems in comparative aspects in acute experiments.

Material and methods

The object of the study were 19 inbreed dogs weighing 8-15 kg (12.39±1.47 kg). Prognostic evaluation of the effectiveness of scoring pathologic conditions was studied by simulating an acute pathological process (peritonitis) according to self-developed experimental technique by introducing mixture of

pathogenic and conditionally pathogenic microorganisms into peritoneal cavity with the addition of adjuvants, which allowed simulating different degrees of severity of the pathological process and progress. To assess the functional state of the organism we determined heart rate (HR), respiratory rate (RR), arterial blood oxygenation indices (PaO_2), arterial blood pH, ionogramm indicators, hematocrit, creatinine, peripheral blood WBC count and formula, conducted a macroscopic assessment of the pathological process development. Statistical analysis performed using the MS® Excel software [1].

Results and discussion

The first stage of the experiment was simulation of acute peritonitis. In 6 (31.6%) dogs modeled local limited peritonitis (1st group), 7 (36.8%) - diffuse (2nd group), and in 6 (31.6%) – caused general peritonitis (3rd group). Twelve and 24 h after initiation of a pathological process defined physiological and laboratory parameters and calculated severity for different SSPCS systems (APACHE, APACHE II, MIP). The calculated results are presented in Fig. 1-3.

Total points for all systems in the different groups of experimental animals were appropriate. For APACHE and APACHE II mean values before modeling pathological process were respectively: in group 1 – 6.71±0.35 and 3.07±0.12 points, in group 2 – 7.01±1.03 and 2.98±0.29 points in the 3rd group – 6.87±0.92 and 3.16±0.24 points.

During the development of experimental peritonitis significant changes of the body's vital signs, which affected the values of the prognostic coefficients took place. However, in group 1 APACHE and MIP indices in contrast to APACHE II decreased after 24 h of the experiment. This may be because APACHE and MIP are more sensitive to the development of compensatory reactions that take place within limited forms of peritonitis.

Attention draws the fact that APACHE indices in group 2 after 24 h and 3rd group after 12 h were almost identical, taking into account that disease duration is not included in the APACHE scoring system. This can be a source of diagnostic errors in the clinical setting because, as shown in Fig. 1-3, predictive value of scoring systems largely depends on the duration of the disease, and not on the time of the patient's admission to the hospital.

Predicted mortality [3, 5] among animals of the 1st group was to be 0% (MIP) or 0-5% (APACHE II and APACHE), 2nd – 29% (MIP) and 5-25% (APACHE II and APACHE). Mortality in the 3rd group was predicted to be 100% (MIP) and 25-100% (APACHE II and APACHE). Actual mortality was in the group 1 – 0% in 2nd – 28.6% (2 dogs died on the 3rd and 4th day of the experiment), the 3rd – 83.3%.

Conclusion

The use of SSPCS systems as prognostic tool is expedient for practical application in clinical settings. In order to increase the probability of forecasting and optimization of treatment strategy it is rational to combine different evaluation scoring systems.

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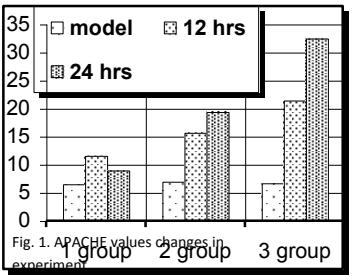

Fig. 1. APACHE values changes in experiment

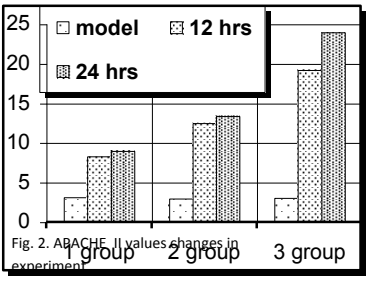

Fig. 2. APACHE II values changes in experiment

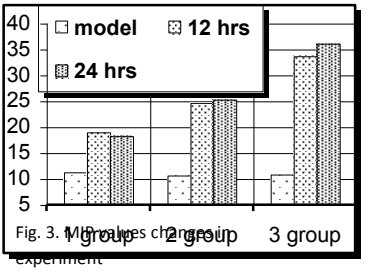

Fig. 3. MPI values changes in experiment