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STATE OF GASTROINTESTINAL MUCOSAL PROTECTION IN NEUROLOGICAL PATIENTS IN CRICICAL STATE

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An observational clinical study was performed with 50 adult participants. The main group consisted of 30 patients with cerebrovascular diseases of the cerebrovascular diseases, which required the organization of intensive care. In the main group, on the 1st day of observation, the level of glycosaminoglycans was higher in 70% (21/30) cases. On the 7th day of observation, this indicator was higher in 100% (30/30) cases. Correlations between the increase in the concentration of glycosaminoglycans and their age, the severity of the condition in accordance with APACHE II, and the start time of enteral nutrition were established. Thus, in neurological patients in critical condition, the protection system of the gastrointestinal mucosa is in a state of functional tension.

Key words: glycosaminoglycans, gastrointestinal tract, vascular syndromes of brain in cerebrovascular diseases, intensive care.

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Patients of intensive care (IC) units always have some degree of central nervous system disturbance, which is associated with both primary brain damage as a result of vascular syndromes of brain in cerebrovascular diseases, traumatic brain injury, exogenous neurotoxic effects, and secondary injuries main reasons of which are universal mechanisms of critical state that develop due to extra-cerebral causes [2].

The survival and rehabilitation of such patients is closely related to the functioning of the gastrointestinal tract (GIT). Firstly, its functioning affects the energetic plastic supply of the nervous system in the context of changed quantitative and qualitative characteristics of nutritional needs. Secondly, the existence of vegetative, immune and metabolic relationships between the brain and the gastrointestinal tract has been proven. Thirdly, under conditions of the critical state of the gastrointestinal tract, it becomes the target of the pathogenetic mechanisms of the critical state [4, 13].

The latter fact is crucial in the lesion of the mucous membrane of the GIT. In this case, the mechanisms of its protection come to absolute or relative impairment. An example of a violation of such protection can be the so-called stress ulcers of the gastrointestinal mucosa of the GIT [5, 9].

Protective mechanisms of the gastrointestinal tract enclose three groups of factors: preepithelial, which are represented in the layer of epithelial mucus; epithelial, which are conditioned by the physical and chemical properties of epitheliocytes, and subepithelial, which include adequate hemocirculation and acid-base balance of mucus membrane of the GIT [1].

An important factor in preepithelial protection are glycosaminoglycans (GAG), which are a major component of the extracellular matrix and constitute heteropolysaccharides consisting of repeating disaccharide units of uranic acid or galactose and amino sugar residues. Disorders of their function are considered as a component of interactions of microbiota and macroorganism, links of sepsis and systemic inflammatory response [8, 10].

The purpose of the work was to evaluate the status of gastrointestinal mucosal protection in neurological patients in critical state by analyzing GAG level.

Materials and methods. An observational clinical study has been performed with 50 adult participants. The main group consisted of 30 patients with vascular syndromes of brain in cerebrovascular diseases (headings of the International Classification of Diseases of the X revision "Vascular brain syndromes in cerebrovascular diseases (G46)"), which required the organization of IC. The control group consisted of 20 practically healthy individuals. The criteria of exclusion from the study were conditions that could affect the level of GAG, namely, the presence of chronic gastrointestinal diseases, dermatoses, collagenoses in the life anamnesis.

Patients or their legal representatives gave written informed consent to participate in the study prior to the study starting date. During the study the patients' rights were respected in accordance with the requirements of the Helsinki Declaration, 1975, as amended in 2005.

Photocolorimetric determination of the GAG level in the blood was conducted by the orcine method. The dynamics of changes in GAG level has been evaluated for over 7 days of IC, and correlations of GAG level with clinical data such as age, gastrointestinal failure GIF severity on a scale The Working

Group on Abdominal Problems) (WGAP), patient gender, APACHE II severity score, onset of enteral nutrition, and mortality were determined.

Statistical materials were represented by non-parametric statistics methods, free of distribution, and were described by the mean values of absolute indexes through the median, upper and lower quartiles "Me (50L; 50U)", relative values - through the percentage and number of cases in the cohort "% (n/N)", absolute values - through the Mann-Whitney test indicating the statistical significance of the result «U; p», relative values - through the Pearson test (χ^2), connection - through the according to Spearman's correlation. We represented the dynamics of indicators through the criterion of signs "G; z; p ». P = 0.05 was considered as the limited level of the latter one [3].

Results of the study and their discussion. The concentration of GAG in the control group and in the main group in the dynamics of the 1st and the 7th days of IC is shown in fig. 1.

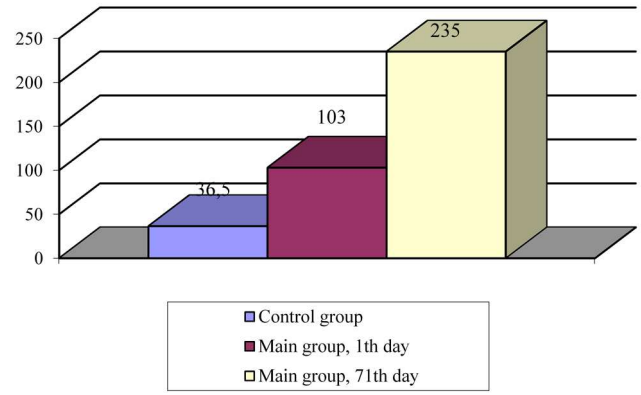

Fig. 1. Concentration of GAG in the control group and in the main group in the dynamics of the 1st and the 7th days of IC.

As the data of fig. 1 show, in the control group the level of GAG in serum was 36,5 (22,5; 88,5) mg/l. In the main group on the 1st day of observation this indicator was equal to 103 (78; 145) mg/l (U=687,5; p<0,01), which was observed in 70% (21/30) of cases. On the 7th day of observation, this indicator reached 235 (132; 369) mg/l, which was significantly higher both in relation to the control group (U=936,5; p<0,01) and to the 1st day of observation (U=522,5; p=0,02). At the same time, an increase in the level of the studied indicator was observed in 100% (30/30) of cases.

The dynamics of these changes are a consequence of disturbance of local homeostasis of gastrointestinal mucosal protection, which is a consequence of stress compensatory reactions of the body through sympathicotonia, massive release of glucocorticosteroids, catecholamines and other stress hormones into the bloodstream. As a consequence, a systemic inflammatory reaction of the body develops, causing bowel ischemia and tissue hypoxia. Due to impaired intestinal motility, failure of enteral nutrition, in most cases, neurologic patients in critical condition develop gastrointestinal insufficiency, characterized by impaired motor, suction, secretory and barrier functions of the gastrointestinal tract. The absence of peristalsis leads to loss of colonization resistance of the intestine, mucosal atrophy, translocation of pathogenic and opportunistic microflora, as a consequence - bacteremia and the development of sepsis. Disorders of the motor and decrease the intestinal functions of the intestine contributes to the accumulation of fluid in the lumen of the intestine and stretching its loops. And the increase in pressure in the lumen of the intestine leads to increased disturbance of the microcirculation in its wall, ischemia and increased intra-abdominal pressure [6, 13].

The level of GAGs in the dynamics decreased in 13% of cases (4/30), and increased in 87% of cases (26/30) (G=86,7; z=3,83; p<0,001), which indicates the progressing of the mucosal protection system intension.

On the 1st day of observation, GIF on the WGAP scale was observed in 30% of cases (10/30), and on the 7th day this indicator became already 80% (24/30) (χ2=13,3; p<0,001). At the same time, the evaluation indicators of the development of this pathology in the dynamics also differed: in 10% of patients (3/30) the manifestations of GIF decreased, in 23% (7/30) remained without dynamics, in 67% (20/30) progressed (G=84,2; z=2,75; p=0,006). These data indicate the progression of GIF.

The correlation links of GAG concentration in the main group with clinical characteristics and data of the course of the IC stage on the 1st day of observation were:

- with age: R=0,35, p=0,02;
- with the gender: R=-0,07, p=0,65;
- with the severity of the condition on a scale APACHE II: R=0,2, p=0,15;
- with GIF severity on a scale WGAP: R=0,18, p=0,18;
- with the starting time of enteric nutrition: R=-0,17, p=0,27;
- with fatality cases: R=0,08, p=0,72.

Correlations links of GAG concentration in the main group with clinical characteristics and data of the course of the IT stage on the 7th day of observation were equal to 11.

- with age: R=0,8, p=<0,01;

- with the gender: R=0,3, p=0,35;
- with the severity of the condition on a scale APACHE II: R=0,4, p=0,01;
- with GIF severity on a scale WGAP: R=0,38, p=0,02;
- with the starting time of enteric nutrition: R=0,4, p=0,02;
- with fatality cases: R=-0,3, p=0,38.

This data prove the existence of statistically significant relationships, indicate a presence of statistically significant correlation between the increase in GAG concentration and age, the severity of state according to APACHE II and the time of onset of enteral nutrition. In this case proceeding from the data in the Table 1, during treatment, the statistical link between growing GAG levels and age increased. On the 7th day of observation the links between APACHE II severity and enteral nutrition time on the 1st day was not statistically significant, and gender and mortality rates were not statistically related to the change of indicator under the study.

The gastrointestinal mucosal protection system in neurological patients in a critical state is in the state of functional tension, as evidenced by an increase in GAG levels. It is the pathogenetic mechanisms of the development of the critical state that cause the development of gastrointestinal insufficiency, which is both the cause and the consequence of the violation of mucosal protection, which leads not only to the violation of nutrient absorption, but also to the disruption of the intestinal barrier function for microorganisms. In critical conditions, there are common mechanisms that lead to mucosal damage and the development of gastrointestinal insufficiency. The most significant mechanisms can be considered ischemic damage, tissue hypoxia, paresis, intraperitoneal hypertension, syndrome of excess bacterial colonization of the intestine. They are closely intertwined and reinforce each other's actions. Intestinal ischemia, together with tissue hypoxia, are classic links in the pathogenesis of critical conditions, manifestations of which are manifested at all levels of the organization of the whole organism. Ischemia develops as a result of the critical state of redistribution of blood flow between organs and systems: most of the arterial blood is distributed in favor of the respiratory, cardiovascular, nervous systems, while the intensity of blood flow in the bowel is reduced. The spasm of the vessels of the intestinal wall leads to a decrease in the volumetric rate of blood flow, the opening of arteriovenous anastomoses and a decrease in perfusion of the tissues of the intestine, especially its mucous membrane. Vasoconstriction in the system of organs of the gastrointestinal tract is much higher than in others, which leads to a disproportionate decrease in blood flow in the intestine in relation to cardiac output and, accordingly, increased manifestations of hypoxia at the tissue and cellular levels. Disturbance of intestinal microcirculation caused by abdominal compartment syndrome, increases ischemia, intestinal edema, leads to the development of microthrombosis, which promotes active microbial translocation from the intestine, causing a clinical picture of systemic inflammation and sepsis. However, intestinal bacterial translocation, which is inherent in patients in critical conditions, not only implements the mechanisms of endotoxicosis and immune changes; there are data on its effect on the structural and functional qualities of microglia, permeability of the blood-brain barrier, memory processes, the development of depression [9, 11].

This may be due to a change in the composition of the intestinal microbiota, for which these compounds create a barrier protecting the macro organism from bacterial translocation [15]. However, the high risk of infection realization caused, in particular, by group B streptococci and S. agalactiae in the elderly people and patients with diabetes is associated with their interaction with GAG, which explains the dependence of changes in their concentration with age [7].

The role of enteral nutrition in maintaining the intestinal mucosal barrier has been proven. Accordingly, its absence requires a tension on the protective mechanisms of the gastrointestinal tract, especially against the background of ischemia and hypoxia [14], which explains the association of changes in GAG levels with the time of enteral nutrition and the severity of APACHE II. Statistics show that about one-third of all inpatients are malnourished. And among patients hospitalized for emergency indications, in the vast majority of cases, malnutrition remains unrecognized, which is an aggravating factor in the effectiveness of treatment and leads to poor clinical prognosis and recovery [12]. Therefore, providing protection of vital functions and stabilization of the patient's condition, it will allow to reduce dysmetabolic disorders in the gastrointestinal tract, to start early enteral nutrition and to achieve the necessary nutritional support by enteral route against the background of hypercatabolism and increased need for nutrients.

Conclusion

Thus, in neurological patients in critical state, the gastrointestinal mucosal protection system is in a state of functional tension, as evidenced by an increase of GAG levels in blood serum. These changes

progress over the IC period, which is also related to the age of the patient, the severity of the state on the APACHE II scale and the starting time of enteral nutrition.

Prospects for further research are to develop methods of improving the quality of gastrointestinal mucosal protection in neurologic patients in critical state on the basis of the obtained data.

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Реферати

СТАН ГАСТРОІНТЕСТИНАЛЬНОГО МУКОЗАЛЬНОГО ЗАХИСТУ У НЕВРОЛОГІЧНИХ ПАЦІЄНТІВ У КРИТИЧНОМУ СТАНІ

Шкурупій Д.А., Могильник А.І., Сонник Є.Г, Удовицька Н.О.

Проведене обсерваційне клінічне дослідження за участю 50 дорослих осіб. Основну групу склали 30 пацієнтів з наявністю гострих порушень мозкового кровообігу, які потребували організації інтенсивної терапії. Контрольну групу склали 20 практично здорових осіб. Встановлено, що концентрація глікозаміногліканів в основній групі була вищої за контрольну в 70% (21/30) випадків на 1-у добу і в 100% (30/30) випадків на 7-у добу спостереження. Також встановлені статистично значимі зв'язки між зростанням концентрації глікозаміногліканів, віком, тяжкістю стану за шкалою APACHE II, часом початку ентерального харчування. Отримані дані свідчать про напруження системи гастроінтестинального мукозального захисту у обстежених хворих.

Ключові слова: глікозаміноглікани, шлунково-кишковий тракт, гостре порушення мозкового кровообігу, інтенсивна терапія.

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СОСТОЯНИЕ ГАСТРОИНТЕСТИНАЛЬНОЙ МУКОЗАЛЬНОЙ ЗАЩИТЫ У НЕВРОЛОГИЧЕСКИХ ПАЦИЕНТОВ В КРИТИЧЕСКОМ СОСТОЯНИИ

Шкурупий Д.А., Могильник А.И., Сонник Е.Г., Удовицкая Н.О.

Проведено обсервационное клиническое исследование с участием 50 взрослых лиц. Основную группу составили 30 пациентов с наличием острых нарушений мозгового кровообращения, нуждающихся в организации интенсивной терапии. Контрольную группу составили 20 практически здоровых лиц. Установлено, что концентрация гликозаминогликанов в основной группе была выше контрольной в 70% (21/30) случаев на первый день и в 100% (30/30) случаев на седьмой день наблюдения. Также установлены статистически значимые связи между ростом концентрации гликозаминогликанов, возрастом, тяжестью состояния по шкале APACHE II, временем начала энтерального питания. Полученные данные свидетельствуют о напряжении системы гастроинтестинальной мукозального защиты у обследованных больных.

Ключевые слова: гликозаминогликаны, желудочно-кишечный тракт, острое нарушение мозгового кровообращения, интенсивная терапия.

Рецензент Дельва М.Ю.