

DEGREE OF ENDOGENIC INTOXICATION AND MICROCIRCULATION OF BLOOD IN THE LIVER WITH EXPERIMENTAL ACUTE INTESTINAL OBSTRUCTION

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✓ *Resume*

One of the pathogenetic factors underlying the mechanism of disruption of vital activity in acute intestinal obstruction is microcirculation disorders, intoxication of the body, and the bulk of toxic agents enters the liver through the portal bloodstream. Consequently, the liver is in very unfavorable conditions and the degree of intoxication and the prognosis of the disease largely depend on its functional state.

Key words: intestinal obstruction, liver microcirculation, endogenous intoxication

ЭКСПЕРИМЕНТАЛ ИЧАК ЎТКАЗМАСЛИГИДА ЭНДОГЕН ИНТОКСИКАЦИЯ ДАРАЖАСИ ВА ЖИГАР МИКРОЦИРКУЛЯЦИЯСИНИНГ ҲОЛАТИ

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✓ *Резюме*

Ўткир эндоген заҳарланиш даражасини аниқлаш мақсадида қон зардобиди ўрта молекуляр пептидлар ЎМП миқдори аниқланди. Обтурацион ва странгуляционнинг ўткир экспериментал ичак тугилишида (ЎИТК), ЎИТК организмда кучли эндоген заҳарланиш билан кечадиган бу жараён касаллик шаклига, ҳамда вақтига боғлиқ. Омил тиклангандан кейин, обтурацион шаклда ЎМП миқдори пасаяди, странгуляцион шаклда эса янада ортади.

Калит сўзлар: ичак тугилиши, жигар микроциркуляцияси, эндоген интоксикация

СТЕПЕНЬ ЭНДОГЕННОЙ ИНТОКСИКАЦИИ И МИКРОЦИРКУЛЯЦИИ КРОВИ В ПЕЧЕНИ ПРИ ЭКСПЕРИМЕНТАЛЬНЫЙ ОСТРОЙ КИШЕЧНОЙ НЕПРОХОДИМОСТИ

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✓ *Резюме*

Одним из патогенетических факторов, лежащих в основе механизма нарушения жизнедеятельности при острой кишечной непроходимости является нарушения микроциркуляции, интоксикация организма, а основная масса токсических агентов поступает в печень через портальный кровоток. Следовательно, печень оказывается в весьма неблагоприятных условиях и от её функционального состояния во многом зависят степень интоксикации и прогноз заболевания.

Ключевые слова: кишечная непроходимость, микроциркуляция печени, эндогенная интоксикация

Relevance

Acute intestinal obstruction (AIO) occupies a special place among acute surgical diseases of the abdominal organs and accounts for up to 9.9% (Krieger et al., 2001). A large number of clinical and experimental works have been dedicated to this important problem.

For the first time, a comprehensive comparative study of microhemocirculatory aspects of the

development of a pathological process in the liver in acute obstructive and strangulated intestinal obstruction was carried out.

In the pathogenesis of acute intestinal obstruction (AIO), the causes are functional and structural changes in the liver. There is a loss of plasma and erythrocytes, toxic products of endotoxemia, loss of electrolytes.

Purpose of the study: To study the degree of endogenous intoxication and microcirculation of blood in the liver in experimental acute intestinal obstruction.

Material and methods

In the experiments, 54 white outbred male rats weighing 160-200 g were used. In recent years, the role of medium molecular peptides in the implementation of structural and functional changes in cells and their role in the development of endotoxemia has been revealed. To elucidate the

membranes of the toxic effect of endotoxins of average molecular weight, we determined their content in the blood serum of experimental animals using the Gabrielyan method. The studies carried out have shown an increase in the content of PFM both at a wavelength of 254 nm and at 272 nm. With obstructive AIC, already from the first hours of the experiment, the content of SMPs containing and not containing aromatic amino acids by 50 and 121%, by 4 hours of the experiment by 70.9 and 210%, after 6 hours by 79.5 and 383%, after 12 by 87 and 315%, after 24 at 100 and 343%.

| Group of animals | SMP, nm | | | |
|------------------|--------------|------------------------------|--------------|------------------------------|
| | 254 | | 272 | |
| | control | experienced | control | experienced |
| 2 hour OKN | 0,301-+0,002 | 0,454-+0,002 0,469-+0,003 | 0,119-+0,003 | 0,263-+0,003 0,268-+0,003 |
| 4 hour OKN | 0,293-+0,001 | 0,501-+0,004 0,513-+0,002 | 0,098-+0,004 | 0,402-+0,004 0,408-+0,003 |
| 6 hour OKN | 0,288-+0,003 | 0,517-+0,008 0,560-+0,006 | 0,090-+0,008 | 0,435-+0,008 0,456-+0,004 |
| 12 hour OKN | 0,286-+0,002 | 0,535-+0,003 0,600-+0,004 | 0,088-+0,002 | 0,454-+0,003 0,494-+0,003 |
| 24 hour OKN | 0,280-+0,008 | 0,561-+0,012 0,612-+0,006 | 0,086-+0,007 | 0,467-+0,002 0,488-+0,013 |

With the strangulation form of AIO, the change was even more pronounced, exceeding the control indicators statistically significant by 55 and 125% after 2 hours, by 75 and 216% after 4 hours, by 94.4 and 306% - after 6, by 109 and 361 % - after 12 hours, by 118 and 367% - 24 hours after the model is reproduced, respectively at 232 and 272 nm wavelengths.

After eliminating the obstruction, the level of SMP with obstructive AIO decreases to 0.461- + 0.002 and 0.388- + 0.009 conventional units, while their value in animals with an unresolved obturation form is 0.501- + 0.04 and 0.402- + 0.04. However, in relation to the values of the control group of animals, these values were significantly higher on the control by 57 and 171%. Subsequently, the SMP indices gradually decreased in relation to the parameters of rats with not eliminated AIO and by the end of the experiment approached the values of the control animals. With strangulation AIC, a gradual increase in the content of PFM is noted at a wavelength of 254 nm, whereas at a wavelength of 272 nm, we did not observe significant changes. Moreover, during all periods of the study, both values of the PFM significantly decreased in the control parameters, more pronounced at a

wavelength of 272 nm. At the same time, with strangulation AIO, high values of SMP remained, exceeding the parameters of the control group by 78.8 and 339% and being 0.527- + 0.007 and 0.431- + 0.011 conventional units, respectively, 2 hours after elimination.

Thus, the studies carried out indicate that AIO proceeds with the rapid development of endogenous intoxication in the body. With strangulation AIO, the degree of endogenous intoxication is more pronounced.

Based on the set goal, the experiment was carried out in 2 directions: in the first, microcirculation (MHC) of the liver was studied in animals with an obstructive variant of acute intestinal obstruction (AIO) reproduced by ligation of the small intestine in the middle third, and in the second series, the above parameter was investigated in rats with AIO strangulation, when a section of the intestine was ligated together with the adjacent mesentery. After 6, 12, 24 and 48 hours after ligation, the animals were withdrawn from the experiments.

The state of the liver MHC was assessed according to the data of vital microscopy of the organ on a luminescent microscope "LYUMAM-IZ" (St. Petersburg, Russia) using a contact

objective. The study was carried out under general thiopental anesthesia.

Data from sham-operated animals served as a control. In total, the experimental animals were divided into the following groups: I - intact; II - control; III - experimental group with obstructive AIO, respectively, with an induction duration of 6, 12, 24, 48 hours and group IV - similar terms for strangulation AIO.

Indicators of liver microcirculation.

In luminescent biomicroscopy, the liver tissue of intact animals appears greenish-blue, and the vessels have a dark shade. In the hepatic tissue, the portal veins and portal venules are clearly visible, from which sinusoids radiate out, often branching and anastomosed with each other. Sinusoids are smooth-walled, often branching cylindrical tubes, the blood flow velocity in them varies greatly. In the sinusoids located in the center of the lobules, the blood flow is more intense compared to the blood flow in the vessels along the periphery of the lobules. Along with the active sinusoids in the liver parenchyma, a small number of non-functioning sinusoids, usually located along the periphery of the lobules, are determined. Before the confluence of the sinusoids into the terminal hepatic venule, which occurs at a right angle or close to that, in most cases there is a narrowing of the lumen of the sinusoid. This once again confirms the presence of sphincters that regulate blood flow. Terminal hepatic venules, into which sinusoids flow, have a shape close to cylindrical or treelike, when 2-3 collecting venules flow into them.

Falsely operated animals are mobile and still react to feeding. The postoperative wound is dry, the abdomen is not swollen. Macroscopically abdominal cavity and formations of pathological features were not revealed. When biomicroscopy of the liver, 2 hours after the beginning of the experiments, there was a slight expansion of the portal venules, sinusoids and central collecting venules and a slight slowdown in blood flow compared with the indices of the intact group of animals. Later (after 6-12 hours), the vascular lumen and blood flow are normalized, which expresses a practical restoration of hemodynamic parameters.

Animals of the main groups after anesthesia and surgery (anesthesia, laparotomy and suturing of the abdominal wall to reproduce the model of obstructive and strangulated AOI) regained consciousness in 20-25 minutes. At the same time, the animals are sedentary, do not take food, lethargic, in rats with strangulation OKH, the stomach is swollen. The reaction of animals to external stimuli is weak.

In the group of rats with obstructive OKH, 2 hours after the model was reproduced, the animals were inactive, did not take food, and quickly responded to hexenal anesthesia. When the abdominal cavity is opened, the stomach is moderately full, at the site of the intestinal wall obstruction, a slight edema is observed, the leading part of the intestine is also moderately enlarged, in contrast to the abducting part, the liver is not enlarged, soft, light brown in color, the edges are sharp.

Biomicroscopy of the liver revealed moderate vasodilation and initiation of intersinusoidal anastomoses (MSA), a slight decrease in blood flow velocity. At a general view, there are no pathological features in the parenchyma. The contours of the vessels are expressive. In contrast to obstructive OKH, animals with strangulation were significantly inhibited, inactive, and their abdomen was strongly distended. During laparotomy, a small volume of serous-hemorrhagic effusion is noted, the intestine area together with the mesentery is edematous with obvious hemorrhagic secretion, the stomach is full, the intestine is dilated to the site of strangulation, the abducting parts are abruptly dormant, the liver is moderately stagnant, the surface is smooth. With biomicroscopy, the vascular pattern is enhanced, the MCA is activated, the vessels are dilated, tortuous along the periphery of the lobules, hyperaggregation of the formed elements, the blood flow is slowed down. At the same time, the central collecting venules are unremarkable, the blood flow in them is intermittent, separated due to the aggregation of formed elements. The contours of the vessels are well contrasted. In the parenchyma without pathological inclusions.

After 4 hours of the experiment with obstructive OKH, the animals remained inactive and did not take food. During laparotomy, the liver is not enlarged in size, of soft consistency, the edges are even, sharp. The stomach is full, the adducting section of the intestine is moderately expanded than the abducting section. Microscopically: intensification of blood flow according to the MCA, insignificant expansion of the central collecting venules, however, the blood flow in them is slowed down. Aggregation of blood corpuscles is noted.

At the same time, but in the group of rats with strangulated OKH, the animals were sharply inhibited, the abdomen was significantly swollen. The postoperative wound is swollen. During laparotomy, a dark-colored hemorrhagic fluid is released from the abdominal cavity. The section of the intestine with strangulation is sharply expanded, with extensive hemorrhages and clear

signs of plasma impregnation of the vessel wall. Around strangulation, nearby formations are soldered to each other and with a clear fibrinous coating. The stomach and the adductor knee of the intestine are sharply expanded.

With biomicroscopy: pronounced vasodilation with a sharp perivascular edema and areas of diapedetic hemorrhage.

During the survey, the mosaic nature of the MHC picture was traced due to the combination of an increased number of obliterated microvessels, weakly vascularized zones and zones with focal changes. In the group with 6-hour obstructive OKH, in contrast to the previous periods of the experiment, the behavior of the animals is inadequate, food is not taken, the stomach is moderately swollen. At autopsy, the stomach is distended. At the site of the obstruction, there is an increase in the adducting part of the intestine in comparison with the abducting one. The liver is congested, of a purple hue.

With biomicroscopy, the phenomena of blood filling are noted, which have the character of venous stasis with vasodilation. The hepatic venules became full-blooded, dilated with pendulum-like blood flow. In addition, there are rare devastated sinusoids, which, in turn, alternate with dilated, blood-filled capillaries. Presinusoidal edema is noted. This phenomenon is especially pronounced in the center of the lobules, which is microscopically characterized by blurring of the boundaries of the vessels. The expansion of the central collecting venules is observed, the blood flow in them is slowed down and the aggregation of blood corpuscles is noted.

Conclusions

Thus, the degree of disturbance of endotoxemia and microcirculation determines the severity of the imbalance in the LPO / AOD system. Elimination of obstruction in the obstructive form reduces the indices of endotoxemia and microcirculation, while in the case of strangulation, they are even more aggravated.

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