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EFFECT OF REPERFUSION TO THE ANTIOXIDANT PROTECTION SYSTEM OF HEPATIC TISSUE IN EARLY STAGE OF ISCHEMIA

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Abstract

One of the actual problems of contemporary medicine is the restoration of the tissue structure that has been impaired. Because today, with the rapid development of medical technology, the pathologies called “inoperabel” were brought to life by organ transplantation. Liver cirrhosis, malignant tumors without metastasis, chronic renal failure, and so on. liver and kidney transplantation has become a therapeutic tool for the treatment of illness.

The experiments were performed on head white rats. Experiments were carried out in accordance with the rules set out in Protocol No. 31 of the Bioethics Committee of 21 April 2008. All weighing procedures and experimental extraction on animals have been accomplished through inhalation anesthesia.

Anesthesia was given to animals to form a liver ischemia model, and the abdominal cavity was opened at full disinfection. The right part of the artery entering the liver has been mobilized and taken to the liver. By using the ligature, a reperfusion pattern has been created to relieve the ischemia.

Keywords

Liver, pathology, tissue, ischemia.

Ишемияның ерте сатысында реперфузияның бауыр тінінің антиоксиданттық қорғау жүйесіне әсері

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Аңдатпа

Замануи медицинаның өзекті проблемаларының бірі тінің бұзылған құрылымын бұрынғы қалпына келтіру болып табылады. «Ота жасауға болмайтын» деп танылған патологиялар бойынша қазіргі таңда медициналық технологиялардың жылдам дамуымен органдар трансплантталуға тиісті. Бауыр циррозына шалдыққан, қатерлі өсінділер мен ісіктер пайда болған кезінде метазданусыз, созылмалы бүйрек жетіспеушілігісіз және өзге де аруларға шалдыққан жағдайда, бауыр мен бүйректі трансплантаттау емдеу әдістерінің бірі болып табылады.

Эксперименттер ақ түсті егеуқұйрықтардың ___ басына жасалған. Аталмыш эксперименттер 2008 жылғы 21 сәуірдегі биоэтика бойынша Комитетте баяндалған ережелеріне сәйкес жүргізілген. Жануарларда жасалатын өлшеу және сынама үшін ішінен алу емшаралары ингаляциялық анестезия арқылы іске асырылған.

Жануарларға бауыр ишемиясының моделін қалыптастыру үшін наркоз берілген, сонымен ішперде құысы толық асептикалық жағдайларында ашылған.

Бауырға келіп түсетін артерияның оң жағы жұмылдырылып, бауырға жеткізілген. Лигатураны қолдана отырып, ишемияны жеңілдету үшін реперфузиялық суреті салынған.

Түйін сөздер

Бауыр, патология, тің, ишемия

Влияние реперфузии на систему антиоксидантной защиты ткани печени на ранней стадии ишемии

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Аннотация

Одной из актуальных проблем современной медицины является восстановление нарушенной структуры ткани. Сегодня с быстрым развитием медицинских технологий, патологии, называемые «неоперабельными», подлежат трансплантации органов. При циррозе печени, злокачественных новообразованиях без метастазирования, хронической почечной недостаточности и других заболеваниях трансплантация печени и почек стала одним из методов лечения.

Эксперименты проводились на ___ головах белых крыс. Эксперименты проводились в соответствии с правилами, изложенными в Протоколе № 31 Комитета по биоэтике от 21 апреля 2008 года. Все процедуры взвешивания и экспериментального извлечения на животных были выполнены под ингаляционной анестезией.

Животным давали наркоз для формирования модели ишемии печени, и брюшную полость открывали при полных асептических условиях. Правая часть артерии, поступающая в печень, была мобилизована и доставлена в печень. Используя лигатуру, был создан реперфузионный рисунок для облегчения ишемии.

Ключевые слова

печень, патология, ткани, ишемия

One of the actual problems of contemporary medicine is the restoration of the tissue structure that has been impaired. Because today, with the rapid development of medical technology, the pathologies called "inoperable" were brought to life by organ transplantation. Liver cirrhosis, malignant tumors without metastasis, chronic renal failure, and so on. liver and kidney transplantation has become a therapeutic tool for the treatment of illness (1,2,3). However, there are a number of problems waiting to be resolved in the organ transplantation. One of them is a toxic effect on the cell membrane, which is formed during tissues during the ischemia and is distributed to the tissues during reperfusion of toxic substances collected into the tissue areas. Despite the fact that the various research efforts to neutralize this effect, some pathological processes in the cell membrane have a negative impact on the function of the transposed member (4,5,6), even under the influence of reperfusion. Given all this, we considered it appropriate to study the effect of strengthening the body's antioxidant protection system by creating liver function and reperfusion in the experiment.

The experiments were performed on ___ head white rats. Experiments were carried out in accordance with the rules set out in Protocol No. 31 of the Bioethics Committee of 21 April 2008. All weighing procedures and experimental extraction on animals have been accomplished through inhalation anesthesia.

Anesthesia was given to animals to form a liver ischemia model, and the abdominal cavity was opened at full disinfection. The right part of the artery entering the liver has been mobilized and taken to the liver. By using the ligature, a reperfusion pattern has been created to relieve the ischemia.

At the end of the experiment, the liver was removed from the abdominal cavity and placed in the Petri casserole and washed with a physiological solution. Then, finely chopped porcelain was assembled into the case and homogenate was prepared by homogenisator. The antioxidant markers were determined by rinsing 1:3 with the homogeneous physiological solution.

To evaluate the body's antioxidant protection system, the following markers have been identified for the liver-prepared homogenate.

1. Protein hydrosulfide groups on the surface (nmol / mq).
2. Structural internal protein hydrosulfide groups (nmol / mq).
3. Reduced glutation (nmol / mq).
4. Activity of the catalase (sv).
5. Total antioxidant activity (cc).

Surface and structural internal hydrosulfide, reduced glutathione Elman (7), catalase enzyme thickness Bergmeyer (8), General antioxidant activity (UAF) E.V.Spector and co. (9).

The experiments were divided into five groups (Table 1).

Table 1.
Separation of white rats by groups under experiment

N	Groups	Experiments	Quantity of experimental animals
1	1	Intact condition	5
2	2	Hepatic ischemic model	15
3	3	Reperfusion after ischemia during 5 minutes	25
4	4	5 min. Ischemia after injection of Mexidol	5
5	5	Perfusion after ischemia of 5 min. through injection of Mexidol	

The obtained quantitative data are statistically quantified by non-parametric method of Wilcoxon - Manna - Whitney taking into account modern recommendations (10).

Practice results.

The homogeneous surface SH - group consisting of liver lipids included in Group 1 is 31.4-35.1 nmol / mg and the mean density is 33.5 ± 0.7 nmol / mg. The density of the reduced gluten is between 12.4 and 14.7 nmol / mg. The average thickness is 13.2 ± 0.4 nmol / mg. The density of the catalase is 264,67-267,35 sq.m. The average thickness is 265.9 ± 0.5 sq. Km. UAF activity was 39.61-41.57% and the mean density was $40.6 \pm 0.3\%$.

The liver's ischemic model has been developed to reduce the thickness of the antioxidant protection system in experimental animals on the fifth minute of the ischemia.

Compared to the intracorporal condition, the density of the SH group in the liver tissue decreased by 0.5%, the concentration of the structural SH group - 1.2%, the density of the reduced gluten content - 1%, the catalase density - 0.2%, the UAF concentration - 1.6%. The quantitative data from the experiments are given in Table 2. As you can see from this, it has been a catalase-enzyme

resistant to ischemia. UAF activity is a marker that is more sensitive to ischemia.

On the 15th minute of the Ischemia model, the antioxidant protection system in liver tissue has significantly lessened.

In 15 minutes after the creation of the Ischemia model, the thickness of the SH group in the liver tissue decreased 6% compared to the intimal state. The decline in the structure of the internal SH group of structures has reached 9.6%. The most decline was recorded in the thickness of the coagulation. The concentration of the known enzyme decreased by 11.5% compared with the intake. During the 15-minute ischemia, as in the previous observation, the density of catalase decreased at a slower pace. Thus, the density of catalase in this period decreased by 0.9% compared to the intake situation. More interesting dynamics were observed in the decrease in UAF activity. Thus, in the fifth minute of the ischemia, when its activity was 1.6%, in the 15th minute this decrease was 4%;

Thus, as the ischemia period lengthens, the antioxidant protection system in the liver tissue paralyzes. This condition is more apparent in the 30th minute of the ischemia. Thus, in the 30th minute, the concentration of homogeneity of liver tissue

Table 2.
Changes in the thickness of the antioxidant protection system markers depending on the duration of the ischemia.

N	Stages of the experiment	Statistical indices	Surface SH group	Structural SH group	Gluation	Catalase	UAF
1	Intact situation	Min	31,4	20,9	12,4	264,67	39,61
		Max	35,1	24,6	14,7	267,35	41,57
		M±m	$33,5 \pm 0,7$	$22,7 \pm 0,7$	$13,2 \pm 0,4$	$265,9 \pm 0,5$	$40,06 \pm 0,3$
2	Ischemia for 5 minutes	Min	31,3	20,07	12,2	264,15	38,4
		Max	35	24	14,6	267	41
		M±m	$33,3 \pm 0,7$	$22,4 \pm 0,6$	$13,1 \pm 0,4$	$265,4 \pm 0,5$	$40,0 \pm 0,5$
		P	*	*	*	*	*
3	Ischemia for 15 minutes	Min	30	17,6	9,2	261	36,4
		Max	33,2	22	13,6	266	40
		M±m	$31,4 \pm 0,6$	$20,5 \pm 0,8$	$11,7 \pm 0,8$	$263,4 \pm 0,9$	$38,9 \pm 0,6$
		P	**	**	*	**	*
4	Ischemia for 30 minutes	Min	27,5	15,6	8,2	258,8	35
		Max	32	22	13,6	266	39
		M±m	$29,5 \pm 0,8$	$18,7 \pm 1,1$	$10,4 \pm 0,9$	$261,6 \pm 1,5$	$37,0 \pm 0,7$
		P	***	**	**	**	***

Note * - $P > 0,05$, ** - $P < 0,05$, *** - $p < 0,01$

was significantly higher than that of the SH group in 11.8%, the density of the structural SH group was 17.5%, the density of reduced glucose content was 21.4%, catalase density was 1.6%, UAF activity was reduced by 9%.

Thus, the results of our experiments allow us to conclude that the liver's ischemia weakens the overall antioxidant protective system in liver tissue and its weakness is correlated with the duration of the ischemia (Table 2).

The white rats included in Group 3 were reperused for 15 minutes after 5 minutes of ischemia. At this time, the following changes in the markers of the general antioxidant protection system in the liver tissue were detected.

The liver tissue in the liver tissue of the experimental animals included in group III decreased by 2.6% compared to the intensity of the SH group and by 2.1% compared to the 5th minute of the 2nd group. Structural density SH group density, respectively, decreased by 4.1% and 2.9% respectively.

The density of the reduced glucose continued to decline. This difference was 6.3% compared to the 1st group and 5.4% compared to the second group. The density of catalase decreased by 1.1% compared with the 1st group and by 0.9% compared to the corresponding period of the 2nd group.

Relevant changes have also been made in the UAF's activity. Thus, its activity decreased by 8.4% compared with the current situation and by 7% compared to the 5th minute of the 2nd group.

Thus, despite the restoration of blood flow, the organism's total antioxidant defense system continues to weaken due to the spread of some intermediate products.

The density of markers of antioxidant protection system, except for the surface SH group, continues to decline in the 30th minute of reperfusion.

The surface SH group, compared with other indicators, increased by 1.4% compared with the current situation and by 2% compared to the corresponding period of the 2nd group.

The density of the internal SH group of the structure decreased by 6.8% in comparison with the intestine and by 5.6% compared to the 30th minute of the ischemia. The thickness of the reduced glucose in liver tissue continued to decline (Table 3). The decrease in its thickness was 4.9% in comparison with the intimal state and 3.9% in 30 minutes of the ischemia.

Unlike other markers of the antioxidant protection system, the density of catalase has changed relatively little. Compared with the duration of both observations, its density was reduced by 1%.

N	Stages of the reperfusion	Statistical indices	Surface SH group	Structural SH group	Gluation	Catalase	UAF
1	Intact condition	Min	31,4	20,9	12,4	264,67	39,61
		Max	35,1	24,6	14,7	267,35	41,57
		M±m	33,5±0,7	22,7±0,7	13,2±0,4	265,9±0,5	40,06±0,3
2	15min	Min	30,4	20	11,2	261,5	35
		Max	34,5	23,4	13,8	264,9	39
		M±m	32,6±0,7	21,8±0,6	12,4±0,4	263,0±0,6	37,2±0,7
		P	*	*	*	**	**
3	30 min	Min	30,8	19,5	11,6	260	35
		Max	39,9	22,7	14	266	41
		M±m	33,9±1,6	21,1±0,6	12,5±0,4	263,2±0,9	38,5±1,0
		P	*	*	*	**	**
4	1 hour	Min	29,7	18,6	11,1	261,5	34,1
		Max	34	23,1	14	265	40,8
		M±m	32,3±0,7	20,8±0,9	12,3±0,5	263,1±0,6	37,9±1,2
		P	*	*	*	***	**
5	3 hours	Min	29,1	18	10,8	261	34
		Max	33,5	22	14	264,7	40
		M±m	31,8±0,8	20,3±1,0	12,2±0,6	262,5±0,6	37,3±1,1
		P	*	*	*	***	**
6	24 hours	Min	29,4	16,7	9	261,7	34
		Max	33,8	23	15	265	41
		M±m	31,4±0,8	20,4±1,3	12,1±1,0	262,9±0,6	37,8±1,3
		P	**	*	*	***	**

Note * - $P > 0,05$, ** - $P < 0,05$, *** - $p < 0,01$

Table 3. Changes in density of antioxidant protection system markers, depending on the duration of reperfusion conducted on 5-minute ischemic background

The decrease in UAF activity continued intensively. Compared to the 30th and 30th week of intestinal and ischemia, its density decreased by 5.2% and 3.6%, respectively.

Thus, in the 30th minute of reperfusion, the antioxidant protection system in liver transplantation continues to decline.

After 1 hour of reperfusion, the density of the SH group in the liver tissue was 3.5% in intravenous condition and 2.9% in comparison with the corresponding period of the 2nd group. The density of the structural SH group has been significantly reduced. This difference was 8.1% in comparison with the intensity level and 7% compared to the 1st hour of the 2nd group. The density of the reduced oxidation has sharply declined. This difference is 6.4% compared to the intensity situation and 5.4% compared to the 1st hour of the 2nd group.

As in each stage, there is not much difference in the thickness of the catalase in the first hour. Its thickness decreased by 1% compared to both comparisons.

There was also a sharp change in the UAF's activity. Its activity decreased by 6.7% in comparison with the current situation and by 5.2% compared to the corresponding period of the 2nd group.

Despite the fact that 3 hours after reperfusion, the antioxidant defense system in the liver continues to weaken.

The concentration of homogeneous surface SH produced from liver decreased by 5.1% compared with the intake and by 4.6% compared to the corresponding period of the 2nd group.

The density of the structural SH group has dropped sharply. The decrease in its concentration was 10.4% compared to the intake situation and 9.3% compared to the corresponding period of the 2nd group.

The density of reduced gluten was 7.7% in comparison with the intake situation and 6.8% in comparison with the corresponding period of the 2nd group. Reduction of catalase density is relatively intensified. Thus, decrease of catalase concentration in liver tissue was 1,3 and 1,1%, respectively, compared to the 1st and 3rd groups.

The density of UAF decreased by 8.1% in comparison with the intensive care unit and by 6.6% compared to the corresponding time of the 2nd group.

Comparison with 24 hours after reperfusion showed that except for the superficial SH group and the density of the reduced glucose, the other indicators were somewhat stabilized and tend to increase compared to the third hour of reperfusion (Table 3).

Thus, the thickness of the surface SH group decreased and the difference in intensity was 6.2% and the difference in the 24th hour of the 2nd group was 5.7%.

Structural SH group density was 10.1% in comparison with the intensity and 8.9% in the 24th hour of the 2nd group.

Decreased density of reduced gluten was 8.3% in comparison with its intake condition and 7.4% compared to the 24th hour of the 2nd group. The density of catalase decreased by 1% compared to the two periods.

Unlike the catalase, the concentration of UAF has been significantly reduced. This difference was 7% compared to the intake situation and 5.5% compared to the 2nd group. Thus, as a result of our experiments, it has been established that, despite the short duration of the ischemia (5 minutes) in the liver, the antioxidant protection system in liver tissue continues to weaken within 24 hours after reperfusion.

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