

artery, but in dogs receiving rheogluman it was shortened by 4 times ($p < 0.05$) compared with dogs of control group II.

Injection of propranolol had an action on both stage I and stage II of elimination of the dye. The initial value in stage I was 4.2 ± 0.8 min, but after ligation of the coronary artery and injection of propranolol it was increased to 6.2 ± 0.6 min (140%) after 15 min and to 6.8 ± 0.5 min (151%) after 90-120 min. The values for stage II were: 31.9 ± 3.5 min before ligation of the branch of the coronary artery, increasing to 58.3 ± 1.7 min (183%) 15 min, and to 60.7 ± 4.2 min (181%) 90-120 min after ligation and injection of propranolol.

It can be concluded from these results that acute focal ischemia leads to marked inhibition of the lymphatic drainage of the heart, detectable as early as during the first 30 min after ligation of the branch of the coronary artery, and progressing in the case of prolonged ischemia. The therapeutic substances tested (heparin, rheogluman, propranolol) have the ability to selectively stimulate the drainage function of the lymphatic system in the myocardium.

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BLOOD PLASMA DIENE CONJUGATES IN UNCOMPLICATED AND COMPLICATED FORMS OF HEALING OF AN EXPERIMENTAL MYOCARDIAL INFARCT

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Physical and social rehabilitation of patients with myocardial infarction are largely determined by the results of healing of the infarcted zone. The causes of early disability of these patients are disturbances of healing with the development of postinfarct aneurysm of the heart and its sequelae in the form of acute and chronic circulatory failure [2, 4, 5].

It has been shown [9] that uncomplicated healing of a myocardial infarct (MI) is based on changes in reactivity appropriate for the severity of the disease, with complete synchronization of necrotic and repair processes. If reactivity is disturbed, these processes are desynchronized, with the result that the heart wall is weakened in the zone of the infarct and hemodynamic factors form a postinfarct cardiac aneurysm or, in more severe cases, cause the wall to rupture [8].

In the course of necrotic and repair processes in the zone of the infarct, the kinetics of cellular reactions with activation of the lipid peroxidation system (LPO) assumes great importance. It is claimed that injury to the cardiomyocytes and other structures of the

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heart wall in myocardial infarction are based on immigration of leukocytes into the zone of the infarct, with the generation of highly active toxic products of oxygen [10, 12, 14]. These data lay at the basis of systems of antioxidative protection of the myocardium during combined treatment of patients, which have been suggested [7, 10].

It was considered important to undertake a goal-directed study of LPO in various forms of healing of MI. The existence of uncomplicated healing of MI in principle suggests that certain optimal variants of changes in the LPO system exist. In that case, in some cases antioxidative protection will be really useful, whereas in others, measures for activation of LPO may be useful, i.e., it is more rational to tackle the problem of modulation of LPO.

A quantitative method of assessment of LPO is to determine plasma concentrations of diene conjugates as markers of hydroperoxides of polyene lipids (primary molecular products of LPO) [6].

Accordingly the investigation described below was carried out to study the principles governing changes in plasma concentrations of diene conjugates in uncomplicated and complicated forms of healing of an experimental MI.

EXPERIMENTAL METHOD

Experiments were carried out on 39 mongrel dogs weighing from 6 to 48 kg. A model of myocardial infarction was created under general anesthesia after thoracotomy by ligation of the anterior interventricular artery in its upper and middle thirds. The animals were divided into three equal series. In Series I no drugs disturbing reactivity and, consequently, healing of MI were given, and the infarct zone healed with a normal postinfarct scar. In series II, the animals were given pyrogenal daily for 7 days in high sessional daily doses, thus creating a model of a hyperreactive complicated healing MI (Author's Certificate 1174966). In the experiments of Series III aminopyrine was given by the same schedule, to create a model of complicated healing of a hyporeactive MI (Author's Certificate 1132306). In Series II and III the course of the disease was complicated by the development of an extensive postinfarct aneurysm of the heart. The aneurysm was larger in the experiments of Series II, as has been explained in earlier publications [8, 9]. The control consisted of seven dogs undergoing mock operations (thoracotomy, pericardotomy) without ligation of the anterior interventricular artery.

Blood samples were taken for determination of plasma levels of diene conjugates before and 3, 7, 15, 18, 24, and 36 h and 3, 5, 9, and 15 days after the operation. The concentration of diene conjugates in the blood plasma was determined by the method in [3].

Reactivity was monitored by studying the level of changes in ACTH, cortisol (CS), the leukocyte count (L) and leukocyte shift index (LSI) of the blood on the first day of myocardial infarction. ACTH and CS were determined by radioimmunoassay, using kits from "Oris" (France) and the Institute of Biorganic Chemistry, Academy of Sciences of the Belorussian SSR. The absolute and differential leukocyte counts were determined by clinical laboratory methods. LSI was determined by the method in [11].

The end result of healing of the zone of MI was monitored by autopsy of the heart on the 15th day. The animals were taken from the experiment in accordance with existing instructions.

The results were subjected to statistical analysis.

EXPERIMENTAL RESULTS

Normal, hyper- and hyporeactivity of the experimental MI in the experiments of Series I-III were confirmed by the results of determination of ACTH, CS, L, and LSI, given in Table 1.

Changes in the blood level of diene conjugates in the course of healing of the experimental MI were phasic in character, with two concentration peaks. The times of the peaks differed in animals in the different series.

The first peak in Series I occurred 24 h, in Series II 18 h, and in Series III 36 h after ligation of the anterior interventricular artery. Higher values of concentration of diene conjugates were observed in Series I, lower values in Series II and III.

The second peak in Series I occurred on the 3rd day of MI and in Series II and III on the 9th day. After these times the plasma level of diene conjugates in animals of different

TABLE 1. Blood ACTH, CS, L, and LSI Levels in Dogs with Experimental MI ($M \pm \sigma$)

Parameter	Series of experiments		
	I	II	III
ACTH, pg/ml	147±37	160±63	123±33
CS, nmol/liter	340±92	497±115	307±96
L, $\times 10^3$ /liter	9.2±3.0	13.4±4.0	7.3±2.5
LSI	0.95±0.57	1.03±0.60	0.76±0.44

series fell gradually. At the second peak the concentration of diene conjugates in the blood plasma was lowest in the animals of Series III, intermediate in value in the animals of Series I, and highest in those of Series II. In the local minimum situated between the two peaks, the concentration of diene conjugates was roughly the same in Series I and II, and greater than in Series III.

The results can be explained as follows. Diene conjugates, as markers of primary molecular LPO products [3, 6] are formed in the presence of MI as a result of metabolism of highly active toxic products of oxygen, generated by leukocytes which have immigrated into the zone of the infarct [10, 13]. In the course of MI two peaks of the cell reactions in the infarct zone can be distinguished. The first corresponds to its infiltration by polymorphonuclear leukocytes and monocytes, immigrating from the blood, and causing necrotization of the ischemic myocardium [1, 14], whereas the second corresponds to proliferation of inflammatory infiltrating cells as the ancestors of the granulation tissue which develops at the site of necrosis [9].

Investigations [9] have shown that polymorphonuclear and macrophagal infiltration of the infarct zone takes place soonest in hyperreactive MI, latest in hyporeactive, and intermediate between the two in normally reactive MI. The times of appearance of the first peak concentration of diene conjugates agreed with the times of peak infiltration of the infarct zone by the types of cells mentioned above, in the corresponding forms of experimental MI. The same publications give the results of determination of the kinetics of granulation tissue cells during healing of an uncomplicated, normally reactive, and of complicated hypo- and hyper-reactive MI. Its comparison with the time course of plasma levels of diene conjugates in the experiments of Series I-III shows that the second peak concentration of diene conjugates corresponds in time with the most rapid proliferation of granulation tissue cells in the infarct zone. During uncomplicated healing of a normally reactive MI the peak of granulation tissue cell proliferation is found on the 3rd-4th day, whereas in the case of complicated hypo- and hyper-reactive MI, it was found on the 7th-9th day or later [1, 9].

It follows from these results that the dynamics of LPO in myocardial infarction corresponds fully to the forms of healing of the infarct and has two periods of activation, associated with necrotic changes and with the development of granulation tissue in the infarct zone, respectively. Accordingly, monitoring changes in LPO in myocardial infarction can be regarded as an effective method of diagnosis and prognosis of the outcome of healing of the infarct. Research aimed not only at developing materials and methods of antioxidative protection, but also at modulating LPO, i.e., restoring its course to that characteristic of uncomplicated MI, is thus indicated in the quest for new methods of optimizing healing of MI.

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EFFECT OF CEREBROSPINAL FLUID FROM DONORS WITH COMPENSATED UNILATERAL
MOTOR DISORDERS ON RECOVERY OF RECIPIENTS WITH MOTOR DEFICIT AFTER
ANALOGOUS TRAUMA

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As was shown previously the cerebrospinal fluid (CSF) of animals 3-4 weeks after unilateral extirpation of the motor neocortex acquires the property of abolishing asymmetrical function of spinal centers in recipients in the acute post-traumatic period after a similar operation. This takes place only if the sides of the trauma are identical in recipients and donors [5]. These results were obtained on spinal animals, in which the character of action of the donor's CSF at the behavioral level remained unexplained. The aim of the present investigation was to study the action of the CSF of animals with compensated motor disturbances after unilateral extirpation of the motor neocortex on the rate of recovery of the recipients with the motor deficit as a result of undergoing identical trauma.

EXPERIMENTAL METHOD

Noninbred male albinorats weighing 160-200 g were used. There were two series of experiments, each comprising 3 groups of animals with 12 rats in each group. An operation of unilateral extirpation of the cortical area of representation of the hind limb was performed on all the experimental animals [2, 3]. In the animals of series I the operation was performed on the left, and in those of series II, on the right hemisphere.

On the second day after the operation, under superficial ether anesthesia, a solution of the freeze-dried CSF of donor animals, with functionally compensated deficit after a similar operation on the cortex, in a dose of 0.15 mg/20 μ l physiological saline, was injected into the cisterna magna of animals of the 1st and 2nd groups of both series. This dose was determined as the most effective in the behavioral test used by preliminary experiments on small groups of animals. CSF was taken from the donors 21 days after unilateral extirpation of the cortical area of representation of the hind limb, for at that time muscle tone in the hind limbs has become symmetrical and CSF and brain extracts of such animals have the property of correcting postural asymmetry of the hind limbs of spinal animals undergoing identical trauma [2, 4, 5]. The sides of injury were the same in the donors and recipients of the first group, but opposite in the donors and recipients of the second group. Animals of the third group served as controls, and they were subjected only to puncture of the dura mater, under similar conditions, in the region of the cisterna magna without injection of the solution of freeze-dried CSF.

The degree of recovery of motor function of the affected limb was assessed by the number of times the rat slipped with their right and left hind limbs when held on a revolving wooden rod [6]. The number of limps of the affected limb per minute was calculated and expressed as a percentage, taking the value of this parameter on the first day (24 h) after the operation as 100%. The numerical results were subjected to statistical analysis by standard methods [1].

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