

EFFECT OF PARTIAL AND TOTAL CORONARY ARTERY OCCLUSION IN RATS ON
ACTIVITY OF CREATINE KINASE AND ITS MB ISOZYME

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To make a comprehensive study of the initial stages of myocardial infarction the writers have previously used with success models of lesions of heart muscle in small animals involving "extraordinary" stimulation of reflexogenic zones [1, 3]. To continue the study of the stages of myocardial infarction and changes in myocardial metabolism in chronic coronary insufficiency the writers have developed a model providing various degrees of occlusion of the left coronary artery (LCA) in rats.

In the investigation described below, activity of creatine kinase (CK) and its MB isozyme (CK-MB) was studied in the heart muscle and blood serum of rats at different times after partial and total occlusion of LCA.

EXPERIMENTAL METHOD

Experiments were carried out on 62 non-inbred male rats weighing 180-200 g. LCA was occluded in anesthetized (amobarbital with chlorpromazine, intraperitoneally) with artificial ventilation of the lungs, by occluding the artery totally or partially by introducing a smooth stilet measuring 1.25 mm in section [2].

CK and CK-MB activity was studied at different times of occlusion of LCA in parallel spectrophotometric tests on blood serum and heart muscle extract [6]. The CK isozymes were fractionated by microcolumn chromatography [5] with certain modifications [3]. CK activity was expressed in international units (IU) and CK-MB activity was calculated as a percentage of total CK activity.

EXPERIMENTAL RESULTS

Levels of CK and CK-MB activity in the myocardial and blood serum of intact rats (Table 1) agreed with data in the literature [4]. Total serum CK activity in animals undergoing a mock operation was moderately raised compared with that in intact rats. Relative CK-MB activity was not significantly changed, evidence that the heart muscle is not the principal source of creatine kinase activity in the blood when it is raised as a result of a mock operation.

After partial occlusion of LPA total CK and CK-MB activity decreased in the heart; the greatest decrease in CK and CK-MB activity was observed 24 h after the operation (from 1233.8 ± 47.9 to 343.3 ± 21.6 IU/g and from 23.3 ± 1.0 to $20.7 \pm 1.1\%$, respectively). Conversely, CK and CK-MB activity in the blood serum increased. Blood enzyme activity was raised as early as 15 min after coronary arterial occlusion, and its highest level was reached after 24 h (49.0 ± 3.7 and 324.2 ± 20.4 IU/ml and 5.5 ± 0.6 and $9.5 \pm 0.4\%$, respectively).

Total occlusion of LCA led to a more marked fall of CK and CK-MB activity in the heart muscle and to an increase in their activity in the blood compared with values obtained in rats subjected to incomplete occlusion of the artery. For instance, CK and CK-MB activity 1 h after total occlusion of LCA was 4-5 times higher than in the control groups. Relative CK-MB activity was higher after complete than after incomplete occlusion, evidence of the

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TABLE 1. Changes in CK and CK-MB Activity during Coronary Arterial Occlusion in Rats

Group of animals	Number of animals	Heart		Blood	
		CK, IU/g	CK-MB, %	CK, IU/ml	CK-MB, %
Intact	8	1233,8±47,9	23,3±1,0	49,0±3,7	5,5±0,6
Mock operation (after 1 h) <i>P</i>	6	1228,3±44,9 >0,05	20,7±1,1 >0,05	75,3±4,8 <0,001	4,9±0,6 >0,05
With partial occlusion after 15 min <i>P</i>	8	1001,1±44,3 <0,01	16,5±0,5 <0,001	110,5±5,8 <0,001	7,0±0,7 >0,05
after 1 h <i>P</i>	8	847,5±30,6 <0,001	15,3±0,4 <0,001	188,3±6,7 <0,001	10,0±0,8 <0,001
after 24 h <i>P</i>	6	343,1±21,6 <0,001	20,7±1,1 >0,05	324,2±20,4 <0,001	9,5±0,4 <0,001
after 14 days With total occlusion <i>P</i>	6	868,3±19,0 <0,001	20,3±1,0 >0,05	45,0±2,8 >0,05	5,0±0,7 >0,05
after 15 min <i>P</i>	12	887,5±17,5 <0,001	16,6±0,6 <0,001	179,0±4,5 <0,001	10,2±0,6 <0,001
after 1 h <i>P</i>	8	216,3±10,1 <0,001	13,0±1,1 <0,001	261,8±9,3 <0,001	22,7±2,4 <0,001

important role of the myocardium as the source of the raised blood enzyme level associated with total OCA occlusion.

The results are thus evidence that the intensity of the rise in the blood enzyme levels is directly proportional to the degree of occlusion of LCA, and levels of CK activity and activity of its cardiospecific MB isozyme in the blood and myocardium are inversely proportional to one another: A greater fall of myocardial enzyme activity corresponds to a higher rise in its level in the blood serum.

It can be concluded from a comparison of these results that the model of chronic myocardial ischemia involving partial occlusion of LCA in rats can be used with advantage to study various forms of disturbance of the coronary circulation and ways of correcting metabolism in heart muscle.

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