Evaluation of parameters related to iron metabolism in the kidney, liver and spleen of pigs that underwent an acute incident of myocardial ischemia

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Summary

Heart failure is one of the most common health problems facing humanity. One of the most common forms of it is coronary artery disease, which is the main cause of heart attack (MI) causing acute heart failure. In recent years, the links between chronic heart failure and iron disorders have been studied. The subject of this study was to investigate whether MI can cause long-term disorders of iron homeostasis. The systemic iron supply and the amount of iron and key proteins involved in iron metabolism in the kidney, liver, and spleen were studied. An additional aspect of the work was the assessment of whether intramyocardial MI stem cell therapy significantly affects iron homeostasis.

The research was conducted on a domestic pig model. The animals were divided into four groups: control group (KON), a group in which MI was induced and 0,9% NaCl normal saline was injected intamyocardially and two groups of pigs in which two tested stem cell suspensions (MI+L1 and MI+L2) were intramyocardially administered. The last two groups received additional takrlimus. All groups received antiplatellet treatment – aspirin. MI was induced by closing the flow in the left anterior descending coronary artery with an angioplastic balloon. Stem cells were administered using the NOGA system. The pigs were examined three times, prior to the procedure, on day 28 and 3 months after MI. The follow-up examination included clinical, electrocardiography, echocardiography, morphological and biochemical blood tests. After the third check-up, the pigs were euthanized, a post-mortem examination was performed and organ samples were taken for histopathological examination (staining of histological slides from organs with Prussian blue to detect and localize iron in tissues) and proteomic examinations. The research was conducted on extracts of tissue homogenates electrophoretically separated in polyacrylamide gels. Western blotting was used to determine the light and heavy ferritin chain in the kidney, liver and spleen and hepcidin protein in the liver. Selected parameters of iron management in blood serum were also

determined. Immunohistochemical reactions for the ferritin light and heavy chain detection were performed in histological slides.

According to the results obtained, an increase in iron resources in the liver and spleen was observed in animals from the MI groups. Higher levels of the ferritin light chain in the liver and the heavy chain in the liver and renal cortex were reported. It was also confirmed that MI was not accompanied by long-term disturbances in the systemic status of iron. In the stem cell groups, significantly lower levels of hepcidin in liver tissue were found.

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