

Summary

Cardiac surgery treatment of heart diseases is a standard method of treating these diseases. During operation, significant changes occur in the physiological functions of the body, which in the instance of heart operations are primarily carried out by the use of cardiopulmonary bypass. The revascularisation method without cardiopulmonary bypass, so-called off-pump method (OPCAB – off-pump coronary artery bypass), has become the alternative method of conventional revascularisation using extracorporeal circulation. Both methods of surgical revascularisation are associated with hemodynamic changes. The negative effects of cardiac surgery and cardiopulmonary bypass on the human body can contribute to developing serious post-surgical complications.

The aim of the work was to monitor metabolic changes occurring in the extracellular space of the skeletal muscle during cardiac operation using interstitial microdialysis. With the help of microdialysis, two standard methods of myocardium revascularisation operations for ischemic heart disease were compared. Operations performed in cardiopulmonary bypass and operations without cardiopulmonary bypass. The aim of the second part of the work was to evaluate tissue (extracellular) concentrations prophylactic administered antibiotic during cardiac operation in cardiopulmonary bypass. To assess the level of adequacy of the standard applied dose scheme of selected antibiotic given in prophylactic form during cardiac operations in cardiopulmonary bypass and to assess the effect of cardiopulmonary bypass on the distribution of antibiotic in peripheral tissue.

In the first part of the work, using a microdialysis catheter applied into the left deltoid muscle, we compared the concentrations of selected endogenous markers of tissue metabolism and tissue perfusion (glucose, lactate, pyruvate, glycerol) in the extracellular space of the peripheral tissue.

The comparison of detected concentrations did not show any significant statistical difference in glucose and lactate tissue concentrations between groups operated on with cardiopulmonary bypass and without cardiopulmonary bypass. The time course of glucose and lactate concentrations were also similar in both groups. The main finding of this work was the statistically significant difference in pyruvate (higher values in off-pump group) and glycerol (higher values in on-pump group) concentrations. The calculation of lactate/pyruvate ratio showed statistically significant differences between the groups (higher in on-pump group).

Based on the findings in differences between both groups, primarily in the higher values of lactate/pyruvate ratio and glycerol concentrations in the on-pump group, we found that revascularisation with the help of cardiopulmonary bypass induces a higher degree of oxygen insufficiency (ischemia) in peripheral tissue. We did not find a relation between the markers of skeletal muscle tissue metabolism, set by microdialysis, and the selected preoperative and postoperative parameters.

Using a microdialysis catheter, we set the extracellular concentrations of prophylactic administered antibiotic (cefuroxime) in the peripheral skeletal muscle. The tissue concentrations were compared with plasma concentrations.

In the *in vitro* study, we proved a satisfactory level of cefuroxime transfer abilities through the microdialysis membrane. The effect of the catheter perfusion speed on the recovery value (extraction fraction) was also monitored. Decreasing recovery value was associated with increasing perfusion speed.

By evaluating the acquired extracellular and plasma concentrations of cefuroxime, it was possible to conclude that the application of 3 grams of cefuroxime at the induction of anaesthesia and 1.5 grams following the termination of extracorporeal circulation ensures sufficient concentrations of antibiotic exceeding the minimum inhibitory concentrations (MIC) for the suspected pathogens. These adequate concentrations were maintained for 120 minutes of extracorporeal circulation.