

THE GLUCOSE UPTAKE AND MECHANICAL RESISTANCE OF RED BLOOD CELLS IN PATIENTS WITH CORONARY HEART DISEASE AND HEART FAILURE

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Purpose. To study the glucose uptake and mechanical resistance of red blood cells (RBC) in patients with coronary artery disease (CAD) with and without chronic heart failure (HF).

Materials and methods. The study involved male and female CAD patients aged 45-65 years (n = 62): without (n = 19) HF, and with HF stage I (n = 28) and stage IIA (n = 15). The control group included 14 age-matched healthy individuals. Aiming to characterize RBC energy metabolism, we studied the intensity of their glucose uptake per one hour of incubation at 37 °C. The degree of RBC membranes change (the contact hemolysis severity) was determined by means of spectrophotometry by the assessment of blood plasma free hemoglobin extinction in the absorption spectrum of hemoglobin (540-543 nm). Peripheral blood smears were fixed with a warm solution of potassium dichromate.

Results. We observed a decrease of RBC glycolytic activity in CAD patients without HF, as compared to the controls ([mean ± standard deviation] $1,03 \pm 0,135$ vs. $1,20 \pm 0,124$ CU/ml x h, respectively; $p < 0,001$), and along with HF progression. Thus, in patients with HF stage I, RBC glycolytic activity was $0,95 \pm 0,074$ CU/ml x h, and tended to be lower than in CAD patients without HF (vs. $1,03 \pm 0,135$ CU/ml x h; $p = 0,027$), but was significantly higher as compared to patients with CAD and HF stage IIA ($0,86 \pm 0,085$ CU/ml x h; $p = 0,002$). The relative increase of the contact hemolysis degree in CAD patients without HF was 100 %, and in CAD patients with HF stage IIA – 180 %. When studying peripheral blood smears in CAD patients with HF stage IIA, we observed the higher amount of transformed RBC (echino- and stomatocytes).

Conclusions. Increasing the degree of contact hemolysis and decreasing of RBC glycolytic activity in CAD patients, in particular with HF syndrome, indicates a decrease in the stability of the circulating population of RBC and acceleration of their «sub-hemolytic» damage in the setting of the lower energy reserve. The increase in the number of transformed forms of RBC in peripheral blood smears suggests the irreversible process of transformation of the majority of RBC, as well as their lower survival in CAD patients with the progression of HF syndrome.