PHAGOCYTIC ACTIVITY OF POLYMORPHONUCLEAR LEUCOCYTES AFTER EXTRACORPORAL TRANSPLANTATION OF SPLEEN (AUTOTRANSPLANTATION)

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Key-words: phagocytic activity — leucocytes — spleen — autotransplantation

From all spleen functions less studied is the immunodefensive one, based on the filtration ability, phagocytic activity and production of specific and non-specific antibodies.

The spleen eliminates from the blood flow the destroyed erythrocytes, thrombocytes (platelets), leucocytes, heterogeneic proteins, bacteria, thus storing all them for a period of 10—15 weeks (I. Barta, 1976). After that these particles can be actively phagocyted. The bigger quantity of macrophages from any organism is concentrated in the spleen and the spleen macrophages differ from the other tissue macrophages with their numerous projections, therefore, expressed phagocytic activity (J. Carr, 1978). The cells from the spleen sinus also show phagocytic activity in a higher degree than that of the ordinary endothelial cells (Moore, 1964).

In the present work we report our results from the investigation of the activity of polymorphonuclear leucocytes from blood coming in and out of extracorporally transplanted spleen with simultaneously applied (intravascularly) suspension of $10^{9.5}$ Staphylococcus aureus.

Material and methods

The experiments were carried out by using non-racional dogs weighing 15—18 kg. Under hexanal narcosis the abdominal cavity was opened, the spleen was taken out in the operative wound, its secondary vessels were ligated, whereas the magistral artery and spleen vein were preparated. The latter were crossed between two vessel clutches. The proximal ends of the vessels were ligated and special teflon canules were placed in the distal ends. The spleen was then wrapped in a sterile bandage and flooded by a saline solution with 37 °C temperature. Later, at the upper posterior third of the spleen an artery was found and disected together with a corresponding vein and the free ends of the canules were inserted there. After all that the microbial solution was injected in the spleen artery and 15 sec later blood samples were taken from the vein for cultivating in special nutritive media. The same procedures with blood samples from the spleen artery and vein were carried out at intervals of 5 min (twice) and then at 10^{th}, 20^{th}, 30^{th}, 45^{th}, 60^{th}, 80^{th}, 120^{th} min.

The method of investigation of phagocytic activity of polymorphonuclear blood leucocytes was after V. M. Berman and E. M. Slavskaya. We determined:

1) The percent of actively phagocyting cells or the so called phagocytic index of Hamburg.

2) Phagocytic figure of Right — the average number of bacteria attached to one leucocyte.

3) The index of phagocytic end — the percent of destroyed microbes among all attached. The reaction was performed by using a 24-hour culture of Staphylococcus, albus, strain 37B (Rebuck J. et al., 1979).

The application of Staphylococcus aureus directly in the spleen artery was the reason to activate the microphagial (polymorphonuclear blood granulocytes) as well as the macrophagial factors (haematogeneic or free macrophages and histogeneic or fixed spleen macrophages) of the non-specific resistance of the organism (Kislyak N. S. et al., 1978).

In the present experiments for the elimination of bacteria out of the blood play a special role two main factors: already cited above defensive factors of the spleen itself, as well as the basic antibacterial defensive factor of the blood.

The state of the latter determined experimentally in numerous tests the effectiveness and successful elimination of staphylococci out of the spleen blood flow. Even a slight only decrease of the integrative functions of the basic antibacterial defensive factor of the blood after all experiments with intravascular application of the bacterial suspension was registered. This can be explained with the natural decrease of the antibacterial reserve of the blood defensive factor after phagocytosis of the applied bacteria; same results shows the in vitro experiment where a decrease of the average number of bacterial cells attached to one leucocyte is established, specially the percent of the destroyed microbes among the attached cells.

15 minutes after application of staphylococci in the animals organism the percent of actively phagocyting cells in the blood from the spleen vein was 30 % less than the initial level and was equal to 38.5±4.2 %. The phagocytic figure was also lower. Similar decrease shew the index of phagocytic end, equal to 26.5±±7.0 %, i. g. 2.5—3.0 times lower than the initial parameters.

In the experiments with high initial levels of the indexes of phagocytosis of the basic antibacterial defensive factor of the blood where the percent of actively phagocyting cells was averagely 78.0±4.5 % the phagocytic figure was 25.5±±3.2 % and the index of phagocytic end reached 80.0±6.7 % despite the high dose of applied in the spleen artery bacteria. From the veins (venous blood) only unsignificant quantity of microbes was lost. Although the percent of actively phagocyting cells in the venous blood decreased to 60.0±4.8 % and the phagocytic figure to 60.4±8.4 % only 1/2—1 hour later, there was almost no loss of bacteria from the venous blood.

In the experiments where a massive lost of microbes from the spleen was registered a considerable decrease of the index of the basic antibacterial defensive factor of the blood was established parrallely with a decrease of those neutrophils, certain number of which could be seen in the microscopic analysis with definite toxic damages. Together with all that under microscope could be established also groups (packs) of extracellularly located bacteria. The study of the phagocytic indexes of the basic antibacterial defensive factors in arterial blood in our cases revealed out a considerable decrease of the phagocytic activity; this all suggested the disorders of the investigated factors due to the current through an infected spleen. All our data prove that the antibacterial defensive factors and their combined system in blood is a very important barrier against microbial infections; the decrease of their activity and functions influence considerably on the total antibacterial resistance of the organism. Our conclusions coincide with the opinion of many other authors (Pigarevskii V. E., 1978; Galankin B. N., 1982; Paltzin A. A., 1982), who presume that the macrophagial system takes an active part in the infectious processes.

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ФАГОЦИТАРНАЯ АКТИВНОСТЬ ПОЛИМОРФНОЯДЕРНЫХ ЛЕЙКОЦИТОВ ПРИ ЭКСТРАКОРПОРАЛЬНОМ ПОДКЛЮЧЕНИИ СЕЛЕЗЕНКИ

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РЕЗЮМЕ

Авторами исследуется защитная функция селезенки. На основе экстракорпорального подключения селезенки и внутрисосудистого введения золотистого стафилококка в селезеночную артерию исследованы микрофагиальное и макрофагиальное звенья.

Активность полиморфнонуклеарных лейкоцитов является мощным антибактериальным барьером и приобретает особое значение при воспалительно-инфекционных процессах в периоде после подключения селезенки.