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Cerebral Strokes Immunopathology

Immunopatologia udarów mózgowych

The central nervous system considering its structure, metabolism and function is one of the most complex bodily organs. It is the main system controlling and coordinating all vital functions of the organism.

As a result of cerebral strokes disorders of the entire metabolistic system occur. They are characterized by disregulation of carbohydrate, lardaceous, proteinaceous and water-electrolytic economy (7, 11).

Immunological disorders occurring in cerebral stroke process are a secondary phenomenon, but they do influence in an essential way the course of the disease (15).

In the interreactions between neuroendocrine and immunological systems they are mutual and are conditioned by: the presence of nervous endings in lymphatic organs; the existence on the immunological system cells receptors for hormones and neuropeptides; the influence of cytokins produced by the immunological system cells on neuroendocrine system; production of some hormones by immunological system cells (9, 14).

The physiological role of the receptors for hormones and peptides occurring on immunological system cells is not known precisely. It is considered that by their intervention the nervous system and the endocrine secretion system regulate immunological functions. The change of functional neuroendocrine system causes the change of immunological reactivity. It has been stated that stress works immunosuppressively, which can be manifested by lowered antiinfectious immunity. This is consistent with other authors' remarks that im-

munological depression caused by acute stress being the outcome of cerebral stroke is a vital pathogenetic agent enabling the progress of inflammatory complications in this disease (4, 14, 15).

The majority of papers regarding the behaviour of immunological system in patients with acute vascular brain damage refer to ischaemic strokes in which the presence of different immunological reactions was stated (15).

The examination of cell immunity conducted *in vitro* showed the lowering of the ability of lymphocytes T to transform under the influence of phytohemaglutinin (16).

Valuation of cell immunity with the usage of rosette test as an expression of lymphocytes T activity, showed a statistically significant lowering of the proportion of lymphocytes creating spontaneous rosettes. There is an analogy with behaviour of blastic transformation test under the influence of phytohemaglutinin, which can testify to the lowering of cell immunity in patients with acute vascular brain damage (17).

Bakuntz observed a decrease in the activity of natural cytostatic agents in patients with cerebral strokes (2).

Członkowska and collaborators demonstrated during the first days of the stroke deviations in cell immunological processes: the decrease of the number of lymphocytes T, lowering of lymphocytes blastogenesis, presence of repressing the migration agent and skin reactivity of a late type (4, 5).

Wender and collaborators observed a significant lowering of the percentage of cells with reactivity of one of surface markers (CD_3) (15).

Immunological humoral reactivity at the beginning of the illness may be changed in a small degree. Członkowska and collaborators' researches prove the decrease of isoagglutinins, level antibodies for *S. typhi* O, increase of the immunoglobulins A and immunoglobulins G. levels. During the first days of cerebral stroke there is a temporary decrease of immunoglobulin G level and increase of immunoglobulin M level after a longer observation (5).

Jankowicz and Wiśniewska showed that in vascular diseases of the central nervous system the rise of immunoglobulin A and immunoglobulin M in blood serum was noticed. The highest level of immunoglobulin A was observed in the first week of the illness, while the

highest level of immunoglobulin M between the 4th and 6th week of the illness. No changes were observed in immunoglobulin G level, which proves the selective reaction of each immunoglobulin class. Similar examination of cerebro-spinal fluid showed that in brain stroke there is a significant increase of average whole protein level and average levels of immunoglobulin A and immunoglobulin M. The behaviour of immunoglobulins in cerebro-spinal fluid is similar to that in serum (10).

There can be found reports about the possibility of local production of immunoglobulins within the central nervous system. In ischaemic stroke focuses the removing of slough is accompanied by phagocytes, lymphocytes and probably cells producing immunoglobulins (13).

Wender and collaborators showed in individual cases of cerebral strokes the increase of immunoglobulin G rate in cerebro-spinal fluid and in some cases the presence of oligoclonal stripe in immunoglobulin G stripe. These results may show the stimulation of at least part of immunological system (15).

Brain tissue in phylogenetic development produces characteristic antigens and isolates from immunological system by the presence of blood-brain barrier. Damage of this barrier during the cerebral stroke may cause immunological reaction by producing antibrain antibodies. Antibodies are generally present in ischaemic stroke and with the improvement in the clinical state regression of immunological reactions is observed (6, 16).

In patients with ischaemic strokes no positive corelation was observed between the behaviour of cellar and humoral immunity. The decrease of cell immunity was shown whereas the essential factors of humoral immunity such as immunoglobulins behave variously (2, 4, 5, 13, 15, 16, 17, 18).

Stress such as cerebral stroke causes stimulation of hypothalamic--pituitary-suprarenal system and intensification of glycocorticosteroids secretion (11) and in a damaged tissue focus cytokins are created (12). Glycocorticosteroids and cytokins stimulate the synthesis of acute phase proteins.

Acute phase proteins may be an index of humoral immunity of the system. Apffel and Peters called them the symbodies. These authors maintain that the higher the level of these proteins in blood serum

the stronger their immunosuppressive activity and the illness is more disadvantageous (1).

Bartosik and Iłżecka examining acute phase proteins in different cases of acute vascular brain damage, demonstrated their highest level in blood in patients with brain haemorrhage, which correlated with more disadvantageous prognosis (3, 8).

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STRESZCZENIE

Udar mózgu powoduje zaburzenia metaboliczne ustroju. Celem pracy było przedstawienie aktualnej wiedzy na temat zaburzeń immunologicznych w tym schorzeniu. Z piśmiennictwa wynika, że w udarze mózgu występuje obniżenie odporności komórkowej, natomiast immunoglobuliny — wskaźniki odporności humoralnej — zachowują się niejednakowo.