The state of the sympathoadrenal and vagoinsular systems in men of mature age, who suffer from allergic dermatoses

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Abstract

The state of sympathoadrenal and vagoinsular systems was estimated in 80 men of different age: healthy men and men who suffer from allergic dermatosis were among them. Daily urinary excretion of adrenaline, noradrenaline, DOPA, dopamine, the levels of insulin and cortisol in the blood serum were studied. The decrease of activity and reserve capacity of sympatho-adrenal system as well as acceleration of biosynthesis of catecholamines at the stages of transformation DOPA in dopamine and dopamine in noradrenaline was fixed in patients, who suffer from allergic dermatoses. High level of strain of glucocorticoid function of adrenal glands and the increase of activity of vagoinsular system, which are combined with the retardation of sympatho-adrenal system; significant disturbances of vegetative homeostasis; reduction of activity of compensatory organism reactions was fixed in patients who suffer from allergic dermatoses. Identified violations substantiate the expediency of carrying out the corrective measures on the improvement of metabolism in brain in men aged 45-64 years as well as the need in the use of pharmaceutical products, which improve metabolism in brain, in patients who suffer from allergic dermatoses.

Key words: sympathoadrenal system, vagoinsular system, men, allergic dermatoses.

In recent years, the incidence of Ukrainian population remains high, it is especially high in people who live under conditions of unfavourable environment. A lot of socio-economic, ecological, psychogenic factors of the environment have negative effect on state of health, and are the cause of the emergence and chronic course of allergic dermatosis in the future [5, 11, 14]. The main dermatoses, where the allergic component is leading in the emergence and development of the disease, are atopic dermatitis, eczema, allergic dermatitis [2, 4, 7]. The study of etiology and pathogenesis of these allergic skin diseases, and the grounded choice of optimal therapy are extremely actual problems of modern medicine [1, 6, 8, 10].

Numerous studies show a complex, multi-faceted nature of violations from different organs and systems in patients who suffer from allergic dermatoses [3, 9, 12, 13]. However, nowadays changes of sympathoadrenal and vago-insular systems, which occur in patients with allergic dermatoses and affect their progress, are studied insufficiently.

So, the aim of investigation was to determine the changes in sympathoadrenal and vagoinsular systems in men of older age groups, who suffer from allergic dermatoses.

MATERIALS AND METHODS

During the investigation 80 men were examined: 17 men aged 25-44 years; 63 men aged 45-64 years (including 33 healthy men and 30 patients, who suffer from allergic dermatoses) among them. The functional state of sympathoadrenal system was evaluated on the basis of determination of daily urine excretion of adrenaline (A), noradrenaline (NA), DOPA, dopamine (DA). As is known, daily urinary excretion of catecholamines and DOPA characterizes not only the functional state of peripheral links of sympathoadrenal system (cerebral layer of suprarenal glands, the sympathetic nervous system) and its reserve opportunities, but, to some extent, the state of the central adrenergic structures of hypothalamus.

The levels of insulin (I) and cortisol (C) were determined in blood serum by immunoenzyme method using standard reagent kits.

It seemed important to understand the nature of relationship between sympatho-adrenal, vago-insular and hypothalamic-pituitary-adrenal systems, which had significant role both in the protective adoptive reactions of organism during the effect of emergency factors on the organism and in the implementation of adaptive-trophic processes in tissues of organs, which underwent aggression.

RESULTS AND DISCUSSION

The concentration of hormones in men of different age groups is represented at table 1, and the ratio of hormones is represented in Fig. 1. The results,
which were obtained in men aged 25-44 years, are taken for 1 for clarity of illustration in Figure 1.

The obtained data are presented in Fig. 1. They show the trends to the inhibition of biosynthesis of catecholamines at the stage of DOPA-dopamine and the trends to acceleration of transformation of dopamine to noradrenaline in men aged 45-54 years, which indirectly indicates a decrease in enzyme activity of DOPA-decarboxylase and minor
trend in increase of activity of dopamine-beta-oxidase. Biosynthesis of catecholamines at the stages of DOPA-dopamine and dopamine-noradrenaline had different directions and there was a significant increase of their urinary excretion. This combination of the rates of synthesis and urine excretion of DOPA, dopamine and noradrenaline can be seen as a result of the increased secretion of dopamine by central dopaminergic structures and noradrenaline by central and peripheral formations of the sympathetic nervous system, and also some of the backlog rate of the synthesis of dopamine and noradrenaline from the rate of their secretion. Coefficient DOPA/dopamine+noradrenaline+adrenaline (DOPA/dopamine+noradrenaline+adrenaline) was higher among men aged 45-64 years compared to men aged 25-44 years. These data show braking transition of DOPA into catecholamines. The decrease of the index adrenaline:noradrenaline in men aged 45-64 years is the result of the increased excretion of noradrenaline, which indicates the prevalence of tone and reactivity of nervous link of adrenergic system over hormone link. The results of the study of excretion and exchange of catecholamines in men aged 45-64 years allow us to conclude, that the increase of functional activity and the reserve capacity of sympathoadrenal system is accompanied by dissociation of the activity of its links (noradrenaline type of dissociation), violations in catecholamines biosynthesis in the form of a mismatch of rates of synthesis of dopamine from DOPA and noradrenaline from dopamine, as well as prevalence of rates of secretion of dopamine and noradrenaline over the rates of their synthesis. The above features of functioning of sympathoadrenal system indicate its dysfunction, insolvency, as it is known, that unidirectional changes of biosynthesis, as well as the dynamic balance between the processes of biosynthesis

Table 1 Urine excretion of catecholamines, cortisol and insulin levels in blood of the examined groups of men

<table>
<thead>
<tr>
<th>Parameters</th>
<th>25-44 years</th>
<th>45-64 years (healthy)</th>
<th>45-64 years (with allergic dermatosis)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adrenaline. nmol/day</td>
<td>35.85±0.361</td>
<td>35.4±0.958</td>
<td>29.44±0.802#</td>
</tr>
<tr>
<td>Noradrenaline. nmol/day</td>
<td>92.22±0.632</td>
<td>92.21±1.389*</td>
<td>92.38±0.846</td>
</tr>
<tr>
<td>Dopamine. nmol/day</td>
<td>160±13.76</td>
<td>1625±30.26</td>
<td>1353±20.89#</td>
</tr>
<tr>
<td>DOPA. nmol/day</td>
<td>193±1.715</td>
<td>210.8±2.669*</td>
<td>170.9±1.696#</td>
</tr>
<tr>
<td>Cortisol. nmol/L</td>
<td>274.8±1.35</td>
<td>321.2±2.738*</td>
<td>388.4±1.967#</td>
</tr>
<tr>
<td>Insulin. mcIU/mL</td>
<td>6.914±0.022</td>
<td>7.174±0.072*</td>
<td>7.385±0.027#</td>
</tr>
</tbody>
</table>

Notes: * – significant differences (P<0.05) when compared with values which were obtained in men aged 25-44 years; # – significant differences (P <0.05) when compared to the respective indicators of healthy men and men, who suffer from allergic dermatoses, aged 45-64 years.

Figure 1. The ratio of hormones in men of different groups (the results, which were obtained in men aged 25-44 years, are taken per 1)
and secretion are observed during preservation of physiological state of the functional activity by the system.

The level of cortisol in blood of men aged 45-64 years statistically reliably exceeded the values obtained in men aged 25-44 years. The same trend was observed in them in insulin level. Coefficient cortisol/insulin, that is the most objective criterion of the severity of the damaging action of the stressor and activity of compensatory processes, which develop in response to the damage, was higher in men aged 45-64 years than in men aged 25-44 years.

The study of the functional state of vegetative nervous system revealed synergistic increase of activity of its sympathetic and parasympathetic links. The presence of functional insolvency of sympatho-adrenal system and vegetative dysfunction does not allow to assess the reaction of the studied systems as an adequate to the force of the stimulus, and therefore it should be considered a stressful, which corresponds to the stage of anxiety stress reactions. And the stimulus for its power should be considered an emergent one. According to the results of the quantitative analysis, the degree of tension of nervous link of sympatho-adrenal system exceeded the tension of the glucocorticoid function of adrenal glands. And, judging by the dissociation of the activity of links in sympatho-adrenal system and the character of disorders in metabolism of catecholamines, the degree of tension of nervous link of sympatho-adrenal system was on the verge of physiological response. These data show, that in this case the active reaction of nervous link of sympatho-adrenal system, which is a necessary element of physiological reaction of protective-adaptive mechanisms, does not play only sanogenetic, but also pathogenetic role. And that is why it can be considered as an important factor in pathogenesis of pathological conditions that are most often diagnosed in men aged 45-64 years.

Analysis of levels of hormones and their ratio in men aged 45-64 years who suffer from allergic dermatoses is presented in table 1 and Fig. 1. As seen from table 1, the excretion of adrenaline, DOPA and dopamine in patients with allergic dermatoses was significantly lower than in healthy men of corresponding age. These data indicate a decrease of functional activity and reserve capacity of sympatho-adrenal system of patients. Accelerated synthesis of catecholamines at the stages of DOPA-dopamine and dopamine-noradrenaline took place (coefficients of relative activity of synthesis - noradrenaline:dopamine (NA:DA) are higher than in healthy men). The activity of enzymes DOPA-decarboxylase and dopamine-beta-oxidase exceeded the activity in healthy men. The reduced coefficient DOPA/dopamine+noradrenaline+a drenaline (DOPA/DA+NA+A) compared with healthy men aged 45-64 years indicates a higher rate of transition of DOPA in catecholamines. The severe dissociation in activity of links of sympatho-adrenal system was seen, as the prevalence of nervous link above hormone link was fixed (coefficient adrenaline: noradrenaline (A:HA) was significantly lower than in healthy men). Acceleration of biosynthesis of catecholamines at the stages of DOPA-dopamine and dopamine-noradrenaline in combination with low activity and reserve capacities of sympatho-adrenal system is probably a consequence of reduction of the stores of catecholamines and, first of all, noradrenaline in the tissues (the action of a feedback mechanism).

Results of research of excretion and biosynthesis of catecholamines provide a basis for concluding that reverse reaction of sympatho-adrenal system on the action of the stressor is unusual and manifests in the decrease of activity of sympatho-adrenal system with a predominance of nervous link above hormone link in patients with allergic dermatoses.

The level of cortisol in blood of patients with allergic dermatoses was significantly higher than the level in healthy men. The same trend was seen in level of insulin in blood. The coefficient noradrenaline-insulin was almost the same as the ratio cortisol-insulin - they were increased compared with ratios in healthy men.

The results of quantitative analysis confirm the high degree of tension of endocrine link and indicate the dyscoordinated nature of their relationship with the elements of neurogenic link of adaptation (antagonistic - with nervous link of adrenergic system and synergistic - with parasympathetic link). Antagonistic relationships also occur between the elements of neurogenic link of adaptation (sympathetic and parasympathetic links).

CONCLUSIONS

1. The decrease of activity and reserve capacity of sympatho-adrenal system as well as acceleration of biosynthesis of catecholamines at the stages of transformation DOPA into dopamine and dopamine into noradrenaline was fixed in patients, who suffer from allergic dermatoses. To a certain extent, this indicates a reduction in tissue stores of catecholamines.

2. High level of strain of glucocorticoid function of adrenal glands and the increase of activity of vagoinsular system, which are combined with the retardation of sympatho-adrenal system; significant disturbances of vegetative homeostasis with oppression of activity of sympathetic nervous system and increased tone and reactivity of parasympathetic nervous system; reduction of activity of compensatory organism reactions was fixed in patients who suffer from allergic dermatoses.

3. Identified violations of relationships of the hormonal link of sympatho-adrenal system substantiate the expediency of carrying out the corrective measures on the improvement of metabolism in brain in men aged 45-64 years as well as the need in the use of pharmaceutical products, which improve metabolism in brain, in complex treatment of patients who suffer from allergic dermatoses. This is a prospect of further investigations in this direction.

REFERENCES