

Interaction of neurotransmitter-containing structures of the skin and thymus in
acupuncture

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SUMMARY

Work investigated interconnection between the main neurotransmitter-containing skin structures in the area of acupuncture points and thymus - as the central organ of immunity after acupuncture. To assess changes in the neurotransmitter status of the skin and thymus, the luminescence-histochemical methods of Falk and Cross and the method of cytospectrofluorimetry were used. The study was carried out on 55 white male rats.

It was found that in intact animals exists strong functional relationships between subepithelial mast cells of the skin in the area of acupuncture points and granular luminescent cells (GLA) of the premedullary zone of the thymus for histamine, catecholamines, serotonin. Acupuncture after 2 hours leads to the establishment of strong correlations in the content of histamine between all studied cells, except for the connection between the mast cells of the papillary layer and GLA of the subcapsular thymus zone. The correlation between GLA of the premedullary thymus zone and the mast cells of the reticular layer of the dermis reaches its maximum values. According to the content of catecholamines and serotonin, strong positive connections are established between all the cells studied.

Key words: acupuncture, neurotransmitters, obese and granular luminescent cells, thymus, skin, acupuncture points.

Introduction

It is known that acupuncture refers to methods that restore the immune status, and the immunomodulatory effect of acupuncture is largely realized by changing the activity of the thymus [1]. The thymus is an important link in the cooperation of the neuroendocrine and immune systems. Regulatory factors providing thymic function, along with cytokines and thymic hormones, are neurotransmitters: catecholamines, histamine, serotonin [2]. According to the literature, some acupuncture methods improve immunological parameters, as well as slow down thymic involution [3, 4, 5].

Previous studies have shown that acupuncture induces early changes in the neurotransmitter structures of the thymus and skin in the area of acupuncture points. The main neurotransmitter-containing cytostructures of the skin and thymus are granular luminescent cells (GLC) and mast cells [6, 7, 8]. The aim of this work is to study the relationship between mast cells of the skin and granular cells of the premedullary and subcapsular zones of the thymus.

Material and research methods

The thymus of 55 white male rats weighing 180-200 g, taken after acupuncture in symmetrical TA LI 11 and GV 14 and skin in the area of the points used. The following groups were distinguished: 1st - intact (no = 5); 2nd - control - 10-minute exposure to the needle next to the TA, where the electrocutaneous resistance (ECR) is more than 100 kOhm (no. = 10); 3rd - experimental, in which for 10 minutes. acted with steel needles in the above-mentioned TA, where EKS = 55-65 kOhm (no. = 40). Organs were harvested in the deep stage of ether anesthesia 15 minutes, 1, 2, 4 hours after IV.

Research results and their discussion

Our studies on the effect of acupuncture on the content of neurotransmitters in the luminescent structures of the thymus showed that the most sensitive to acupuncture are premedullary and subcapsular GLA and thymic mast cells. GLA of the premedullary zone of the thymus, thymocytes of the cortex and medulla, react faster and more intensely than GLA of the subcapsular zone of the thymus [6]. According to the literature, premedullary GLA of the thymus play the role of aminoproducers, and subcapsular GLA, to a greater extent, amine absorbers [10]. Among them, there are macrophages, interdigitating cells, as well as cells of the neuroendocrine system, which is confirmed by immunohistochemical methods. GLK was first found by P. Motavkin (1977) in the membranes of the brain and called aminocytes. GLA detected in the thymus, spleen, appendix, bone marrow, lymph nodes,

In the skin of rats, in the projection of acupuncture points, the main neurotransmitter-containing structures are the mast cells of the papillary dermis, located under the epithelium, as well as the reticular layer of the dermis, located at the border of the reticular layer and the hypodermis. Here, single GLA are detected. In humans, the expression of neuron-specific enolase and synaptophysin at the sites of GLA luminescence was detected by the immunohistochemical method using monoclonal antibodies (MCAT), which confirms their neuroendocrine nature [12]. Mast cells in the lower third of the reticular layer of the dermis store more neurotransmitters than cells located under the epithelium in the papillary layer. Neuroamines and regulatory peptides synthesized and secreted by mast cells are involved in triggering the body's response to acupuncture. Acupuncture causes dislocation and degranulation of mast cells,

In response to 10-minute acupuncture, we revealed an ambiguous reaction of skin mast cells from the distal TA LI 11 and dorsal TA GV 14 after 15 minutes. and 1 hour after the procedure. The reaction of monoamines on the part of TC

the reticular layer in the distal TA LI 11 was more intense. At the same point, the increase in the content of histamine persisted longer, and the initial values came only 4 hours after acupuncture. In dorsal TA GV 14, the concentration of histamine returned to the initial one already after 1 h after acupuncture. However, the direction of changes in the content of neurotransmitters in both studied points coincided. To carry out the correlation analysis, we used the numerical data of the distal TA LI 11.

The analysis of correlations revealed that in intact animals, in terms of histamine content, strong positive relationships were found between GLA of the premedullary zone of the thymus and subepithelial MCs of the skin. In all other cases, the connections were of average significance (Table 1).

Table 1

Correlation relationships in the content of histamine, catecholamines between bioamine-containing structures of the skin in the area of acupuncture points and thymus after acupuncture (IS)

	инт	через 15 мин.		через 1 ч		через 2 ч		через 4 ч	
		о	к	о	к	о	к	о	к
по содержанию гистамина									
Тучные клетки под эпителием / премедуллярные ГЛК тимуса	0,74	0,8**	0,7	-0,6	0,6	0,74	0,6	0,77	0,6
Тучные клетки под эпителием/ГЛК субкапсулярной зоны тимуса	0,4	0,4	0,4	0,5	0,4	0,7**	0,4	0,5	0,5
Тучные клетки сетчатого слоя дер- мы/премедуллярные ГЛК тимуса	0,5	0,82**	0,7	0,8**	0,5	0,96	0,6	0,8**	0,5
Тучные клетки сетчатого слоя / ГЛК субкапсулярной зоны тимуса	0,5	0,43	0,4	0,7**	0,4	0,7**	0,4	0,43	0,4
по содержанию катехоламинов									
Тучные клетки сосочкового слоя дер- мы / премедуллярные ГЛК тимуса	0,74	0,88	0,7	0,6	0,6	0,74	0,6	0,77	0,6
Тучные клетки сосочкового слоя дер- мы / ГЛК субкапсулярной зоны тимуса	0,4	0,4**	0,4	0,5	0,4	0,8**	0,4	0,5**	0,5
Тучные клетки сетчатого слоя дер- мы / премедуллярные ГЛК тимуса	0,5	0,82	0,7	0,8	0,5	0,89	0,6	0,8**	0,5
Тучные клетки сетчатого слоя/ГЛК субкапсулярной зоны тимуса	0,3	0,43	0,4	0,57	0,4	0,87	0,4	0,43	0,4

Примечания: ГЛК – гранулярные люминесцирующие клетки, инт. – интактные крысы, о – опытная группа. к – контрольная группа; ** – $p < 0,05$

Both in the content of catecholamines and in the content of serotonin, a strong positive correlation was found between the GLA of the premedullary zone of the thymus and subepithelial MCs of the skin; moderate positive relationships were found between the GLA of the premedullary zone of the thymus and the MCs of the reticular layer of the skin. In the rest of the studied pairs, correlations were weak (Table 1). After 15 minutes. after acupuncture, a strong correlation is established between the GLA of the premedullary zone of the thymus and the MC of the reticular layer of the dermis in terms of histamine content. In control, this type of connection is also enhanced, but to a lesser extent. According to the content of monoamines, the correlations between GLA are enhanced

premedullary zone of the thymus and TC of the reticular layer of the dermis. In the rest of the studied pairs, the connections remain at the same level (moderate in the control (see Table 1)).

One hour after acupuncture, a decrease in histamine in subepithelial mast cells is accompanied by the appearance of a negative relationship between them and GLA in the premedullary thymus zone. The correlation between the GLA of the premedullary zone of the thymus and the MC of the reticular layer remains strong. The control revealed moderate connections.

According to the content of monoamines, the correlation relationship between the MC of the papillary and reticular dermis and GLA of the premedullary thymus zone is weakened. An average correlation is established between the GLA of the subcapsular zone of the thymus and the revealed MCs of both the subepithelial zone and the reticular layer. In control, communications are moderate. Considering the fact that the Unna staining of the same sections revealed massive degranulation of MCs in the thymus septa and at the border of the reticular layer of the dermis, it can be assumed that degranulation of mast cells leads to a sharp increase in the concentration of monoamines in the connective tissue matrix of the skin. In this connection, part of the thymus GLA population is forced to absorb monoamines, that is, to take on the role of the main amino absorbers instead of mast cells.

Two hours after acupuncture, in terms of histamine content, strong positive relationships were established between all the studied cells, except for the MC of the papillary layer and GLA of the subcapsular thymus zone. The correlation between GLA of the premedullary zone of the thymus and MC of the reticular layer of the dermis reaches its maximum values. In control, communications are moderate (see table).

According to the content of catecholamines and serotonin, strong positive connections are established between all the cells studied. It is possible that mast cells and macrophages of the subcapsular zone of the thymus begin to work in tandem (see table).

The correlation between GLA of the premedullary zone of the thymus and MC of the reticular layer of the dermis reaches its maximum values. 4 h after RI, the values of all studied bioamines approach the initial values. Thus, it was found that the neuroamine-containing structures of the skin in the area of acupuncture points and thymus are interconnected and mutually influence each other. Strong histamine bonds unite the premedullary GLA of the thymus and the subepithelial mast cells of the skin. A session of acupuncture strengthens the connections of the mast cells of the reticular layer of the dermis in the area of acupuncture points and the GLA of the thymus. The greatest strengthening of connections in the content of histamine is noted 2 hours after acupuncture.

According to the content of catecholamines and serotonin, acupuncture leads to an increase in the connections between the mast cells of the skin and the subcapsular GLA of the thymus 2 hours after the procedure.

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Guryanova, E.A. Interaction of neurotransmitter-containing structures of the skin and thymus during acupuncture / E.A. Guryanova, E.V. Lyubovtseva, A.V. Filonenko // *Traditional Medicine.* - 2009. - No. 4 (19). - S.46-48.

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