MORPHOLOGY AND PATHOMORPHOLOGY

Functional Asymmetry of the Thymicoadrenal System is Reflected in the State of the Reticular Zone of Adrenals after Allogenic Transplantation of the Left or Right Thymic Lobe

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Translated from *Byulleten' Eksperimental'noi Biologii i Meditsiny*, Vol. 124, No. 11, pp. 577-579, November, 1996
Original article submitted September 16, 1996

The effects of grafting left or right thymic lobe into thymectomized male BALB/c mice were studied. Selective retention of mononuclear leukocytes in the reticular zone determined by variant of grafting were demonstrated. Higher activity of adrenocorticocytes and lesser amount of mononuclear leukocytes were observed in the reticular zone of adrenal homolateral to the thymic lobe graft.

Key Words: *thymus; reticular zone of adrenals; functional asymmetry; mononuclear leukocytes*

An asymmetric influence of the left and right thymic lobes on the functional state of lymph nodes and spleen and on the resistance to enterobacterial infection has been demonstrated. Functional asymmetry of the adrenals has been observed in intact animals and in those exposed to short-wave radiation. There is evidence that functional state of the reticular zone of adrenals depends on the thymus: this zone is hypertrophied in neonatally thymectomized mice [2].

We investigated functional asymmetry of the reticular zone of adrenals after transplantation of left or right thymic lobe.

MATERIALS AND METHODS

Experiments were performed on 39 male BALB/c mice. At the age of 4 weeks the mice were thymectomized under Nembutal anesthesia, after which left or right thymic lobe was grafted subcutaneously in the inguinal area. The grafts were obtained from BALB/c mice. Sham thymectomy and incisions in the inguinal area without grafting were made in control mice. Four weeks after surgery, the animals were killed by cervical dislocation and material for the investigation was collected.

Thymic grafts and adrenals were fixed in Carnoy's fluid. Paraffin sections (5-6-μ thick) were stained with hematoxylin and eosin. Histometry was performed using a grid with evenly distributed points [1]. The cortex—medulla ratio in the thymus was determined. The volume of the adrenocorticocytes' nuclei in the reticular zone was measured and the mononuclear leukocytes contacting with the reticular zone adrenocorticocytes were calculated.

The results were analyzed by Student's t test, χ^2 test, and nonparametric Fischer's test.

RESULTS

In intact mice, the volume of the nuclei of the reticular zone adrenocorticocytes was greater in the

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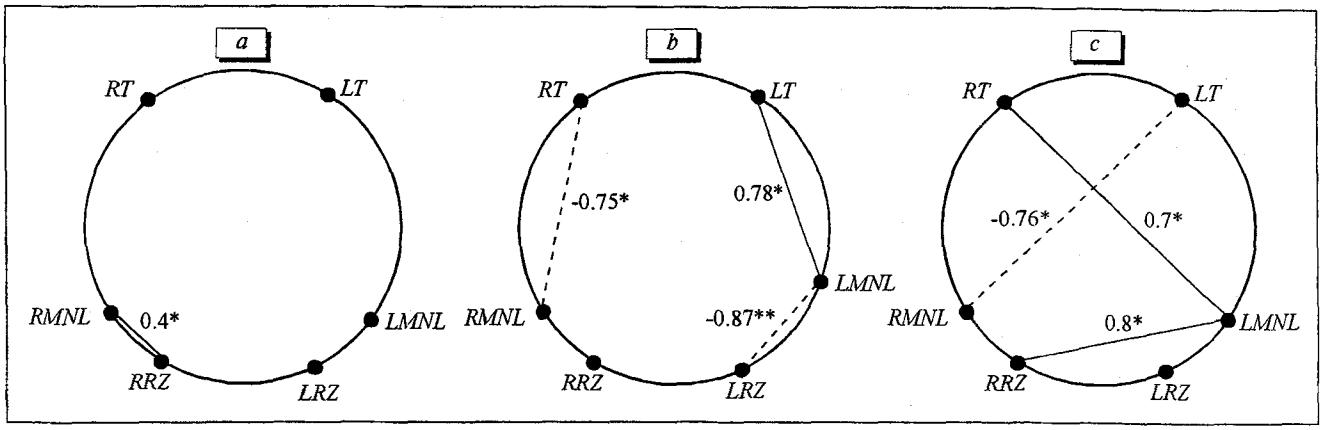

Fig. 1. Structure of correlations between functional parameters of thymus and reticular zone of adrenals. *a*) intact animals; *b*) grafting of the right thymic lobe; *c*) grafting of the left thymic lobe. *RT*, *LT*) the cortex—medulla ratio in thymic lobes grafted in the right and left inguinal areas; *RMNL*, *LMNL*) contents of mononuclear leukocytes in the right and left adrenal gland; *RRZ*, *LRZ*) volumes of the nuclei of adrenocorticocytes in the reticular zone of right and left adrenal gland, respectively.

right adrenal gland, while the number of mononuclear leukocytes was the same in both adrenals.

Transplantation of left or right thymic lobe activated the reticular zone adrenocorticocytes in comparison with adrenocorticocytes of intact mice. Right and left lobe grafts produced different effects on the reticular zone. The number of mononuclear leukocytes in the reticular zone of the right adrenal decreased after transplantation of the right thymic lobe. Grafting of the left thymic lobe caused an decrease in the number of these cells in the reticular zone of the left adrenal. A decrease in the content of mononuclear leukocytes coincided with a higher functional activity of adrenocorticocytes in the reticular zone. This phenomenon was statistically significant in the left adrenal and exhibited a tendency toward statistical significance in the right adrenal.

The structure of correlations shown in Fig. 1 indicates, on the one hand, contralateral relationships between mononuclear leukocytes of the right and left adrenal with the thymus and, on the other hand, depends on the fact which lobe of the thymus was transplanted. The content of mononuclear leukocytes in the right adrenal negatively correlated with the cortex—medulla ratio in the thymus. In the left adrenal this correlation was positive.

The difference was determined by the fact that after transplantation of the right thymic lobe the correlation was established between the parameters of the thymus grafted in the homolateral inguinal area, while after transplantation of the left thymic lobe the content of mononuclear leukocytes correlated with the parameters of the thymus grafted in the left inguinal area. The content of mononuclear leukocytes correlated with the volume of adrenocorticocytes only in the reticular zone of the left adrenal. The correlation was negative after transplantation of right thymic lobe and positive after grafting the left thymic lobe.

Thus, a separate retention of mononuclear leukocytes (predominantly lymphocytes) occurs in the reticular zone of adrenals. The asymmetry of the effects of thymic grafts on reticular zone manifests itself as increased activity of adrenocorticocytes and decreased content of mononuclear leukocytes in the homolateral adrenal gland. The sign of correlation between the number of mononuclear leukocytes in the reticular zone and the cortex—medulla ratio in

TABLE 1. Dependence between State of Adrenal Reticular Zone and Variant of Thymic Transplantation (*M*±*m*)

Group		Right adrenal		Left adrenal	
		leukocyte/ adrenocorticocyte ratio	volume of adrenocorticocyte nuclei, μ^3	leukocyte/ adrenocorticocyte ratio	volume of adrenocorticocyte nuclei, μ^3
Control		0.67±0.036	41.6±1.4	0.68±0.028	37.6±1.6[3]
Thymic graft:	right lobe	0.50±0.047[1]	69.3±10.3[1]	0.75±0.10[3]	54.0±5.1[1]
	left lobe	0.70±0.077[2]	60.1±6.0[1]	0.50±0.028[1,2x,3]	68.1±6.3[1,2x]

Note. [1]Differences are significant compared with the control; [2]compared with mice grafted right thymic lobe; [2x]according to χ^2 test; [3]compared with mice grafted right thymic lobe.

the thymus probably points to the fact that upon involution of the thymus mononuclear leukocytes area accumulated in the reticular zone of right adrenal, while their content in the reticular zone of left adrenal decreases.

The presence of mononuclear leukocytes in the reticular zone may results from regulatory interaction between these cells and adrenocorticocytes. This interaction is based on a well-established ability of mononuclear leukocytes to synthesize opioid peptides, including adrenocorticotropic hormone, endorphins, prolactin, etc. [4-6]. On the other hand, since the concentration of hormones in the juxtacellular space of adrenocorticocytes is several orders of magnitude higher than that in the blood [3], the functional state of mononuclear leukocytes may change.

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