ACCESSORY GROUPS OF NONAPEPTIDERIC CELLS OF THE DIENCEPHALON IN INTACT AND HYPOPHYSECTOMIZED RATS

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In the higher vertebrates, starting with the reptiles, three large, separate nonapeptidergic neurosecretory centers are formed in the hypothalamus: the supraoptic, the paraventricular, and the postoptic nuclei [3]. The anterior commissural nucleus, due to its large dimensions and independant functional significance, is also numbered among the nonapeptidergic nuclei [1, 6]. Smaller clusters of nonapeptidergic cells (NPC), which exhibit constant localization, are situated between these nuclei. They are called accessory groups (AG). The entire aggregate of the NPC represents a unitary complex from the genetic and morphofunctional perspective, one which elaborates principally the nonapeptidergic hormones, oxytocin and vasopressin [4]. The AG have been described in reptiles [10], birds [8], and mammals, including man [3-5, 11, 15, 17].

An especially large number of papers have been devoted to the study of the localization of the AG in the rat [11, 15, 17]. However, the assessments of the functional role of the AG are contradictory. Some authors believe that the AG may compensate the function of destroyed neurosecretory nuclei [3, 7]; others do not ascribe substantial significance to them [14]. Hypotheses have been advanced to the effect that AG of various localizations have different functions [13, 18]. The problem of the associations of the oxytocinergic (OTE) and vasopressinergic (VPE) cells of the AG with neurohemal regions remains insufficiently studied.

MATERIAL AND METHODS

Male Wistar rats, weighing 120-150 g, served as the investigational objects. Three animals were hypophysectomized transsphenoidally. The rats were decapitated on the seventh day following the operation. Five intact male Wistar rats served as the control. The brain was fixed in a mixture of picric acid and 40% formalin (3 : 5) at 37°C for one week. The OTE and VPE structures were demonstrated immunohistochemically in serial paraffin sections using the PAP method. Some of the material was stained with paraldehyde-fuchsin after Gomori-Gabe and counterstained with azan after Heidenhain. The number of OTE and VPE cells in each of the AG were counted on both sides in the serial immunohistochemical sections, and only those sections of cells which contained a nucleolus were taken into account. The diameters of the cell bodies of their nuclei and nucleoli were measured by means of an MOV 1-15× screw ocular micrometer at a magnification of 15 × 90, and the cross-sectional area was calculated from the formulae: $S = (r/4)d^2$ for the nucleoli and $S = (r/4)Dd$ for the nuclei and cell bodies. The significance of the differences of the results were assessed by means of the Student t test.

RESULTS AND DISCUSSION

The following AG were examined in the diencephalon of the rats: the circular, perifornicial, ventrolateral, dorsolateral, and periventricularly situated NPC, and the group of the stria medullaris of the thalamus (Fig. 1).


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The circular group of NPC is located above and somewhat lateral to the suprachiasmatic nucleus. Relatively small NPC surround a venule in the form of a sleeve (Fig. 2a). In all 230 ± 3 cells are contained in the groups in the control animals, and the OTE cells make up a little more than a half (54%). The immunoreactive material in the VPE cells uniformly fill the cytoplasm; individual fragments of thick fibers are demonstrated. The changes are similar in the OTE and VPE cells in the hypophysectomized rats: the cross-sectional area of the nucleolus is significantly (P < 0.01) decreased (from 5.61 ± 0.15 to 3.92 ± 0.08 μm²; in the VPE cells, from 5.21 ± 0.18 to 3.43 ± 0.10 μm²), although the sizes of the nucleus and the cell body are unchanged (Fig. 3).

The perifornicial group of NPC is localized at the level of the paraventricular nucleus above the column of the fornix. The large NPC surround an arteriole, densely abutting its wall. Processes of the NPC, filled with immunoreactive contents, can be traced along the arteriole for some distance. In the control rats, 102 ± 3 cells with a predominance of VPE cells (68%) are concentrated in the groups. The cross-sectional area of the nucleolus of the VPE cells in the hypophysectomized rats remains substantially unchanged; the cross-sectional area of the nucleus is increased (from 65 ± 4 to 75.7 ± 1.6 μm²; P < 0.01); the increase in the cross-sectional area of the cell bodies is insignificant. The cross-sectional area of the nucleoli of the OTE cells is decreased significantly (P < 0.01) (from 6.51 ± 0.22 to 5.12 ± 0.16 μm²); the cross-sectional areas of the nucleus and the cell body are unchanged.