NEUROSECRETORY PHENOMENON OF THE PARAVENTRICULAR NUCLEUS IN A SENILE WOMAN

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The hypothalamo-hypophyseal neurosecretory system in human subjects has been extensively explored since the first description by Scharrer and Gaupp (1933), more than 255 cases being reported until the most recent article by Palay (1953). According to Palay who adopted the famous Gomori’s tinctorial technique of chrome-alum hematoxylin and phloxine in histological observation with 20 human materials, much similarity was disclosed with the hypothalamic neurosecretory phenomena between the human and the other vertebrate systems.

The present report deals with observation of neurosecretory phenomenon in the region of the paraventricular nucleus of a senile woman who died of bleeding in the medulla oblongata.

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MATERIAL AND METHOD

The brain obtained at autopsy of a 70 years old woman died of bleeding in the medulla oblongata was used for the present observation. Autopsy was made at the end of 2 hrs. and half after death, and the tissue of the hypothalamus was fixed by immersion in 10% formalin for three days, being followed by immersion for 3 days in Zenker-formol solution renewed once a day. The tissue was embedded in paraffin, cut sagittally in 9μ thickness, and stained with Gomori’s chrome-alum hematoxylin and phloxine (CH-P).

OBSERVATION

The paraventricular nucleus in the present material occupied an area elongated in antero-posterior direction and more or less compressed supero-inferiorly. The cytoplasm of the cells of the nucleus stained in violet blue uniformly shaded by a reddish hue in the chrome-alum hematoxylin and phloxine preparation. Cells found at both the caudal and ventral parts were smaller than those found in other parts of the nucleus. Most of the cells were surrounded by large or small vacuoles, which seems to be signs of the post-mortem artifact (Hagen, 1952; Palay, 1953).

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It was interesting to observe that more or less significant decrease was the case with the cytoplasmic basophile substances in contrast to the increase of acidophile substances. Granular cytoplasmic inclusions reacting positively to chrome-alum hematoxylin were found at the perinuclear area of the cells of the paraventricular nucleus. In some of the cells, abundance of the chrome-hematoxylin positive granules was much more apparent. The so-called "Herring bodies" were not observed either within or in the neighborhood of the paraventricular area. CH-positive granules were found in a few of the nerve fibers arising from the cells of the nucleus (Fig. 1). Many of the cells of the nucleus were located in close proximity to the blood capillaries: the fact was frequently reported by the previous workers (Scharrer and Gaupp, 1933; Scharrer, 1936; 1941; Foley, Kinney and Alexander, 1942; Bargmann, et al, 1950; Ortmann, 1951; Enami and Imai, 1955).

Fig. 1. Nerve cell provided with almost intact secretory activity.  
Note accumulation of CH-positive material in the axon-hillock.

Fig. 2. Intracellular vacuole in a cell of the paraventricular nucleus.

Fig. 3. Cell with perinuclear clear zone.

Fig. 4. Cell with red pyknotic nucleus stained intensely with both CH and phloxine.

In some of the cells of the paraventricular nucleus, intracellular vacuoles were observed at the site of the peripheral Nissl area, in which CH-positive material was abundant (Fig. 2). In other cells, marked perinuclear clear zone (Fig. 3) was occasionally observed. There were a few cells with the characteristic red pyknotic nuclei intensely stained with both CH and phloxin (Fig. 4).
According to Scharrer and Gaupp (1933), multi-nucleated cells were frequently observed in both the supraoptic and the paraventricular nuclei of man. On the other hand, Palay (1953) reported that bi-nucleated cells occur only in small numbers, and multi-nucleated cells appear to be wholly absent. In the present histological observation, any sign of the occurrence of either bi-nucleated or multi-nucleated cells was not found.

COMMENTS

So far as the present observation is concerned, neurosecretory activity of the patient was not so significant. As mentioned above, the vacuoles were frequently found around the periphery of the cells of the paraventricular nucleus. Such vacuoles was thought to be representing a secretory process (Gaupp, 1936). However, it was stated that such vacuoles did not appear in the material fixed well in situ by vascular perfusion (Palay, 1953). In the present observation, the peripheral vacuoles in question were abundantly found in the area of the paraventricular nucleus, whose morphological characters did not afford any clue for the judgement of their cytological significance. Secretory activity of neurosecretory cells, in general, was described in accordance with the amount of the secretory material produced, dimensions and stainability of the Nissl area, morphological characters of the nucleus, etc. In the present preparation, neuron somata of the paraventricular nucleus were largely devoid of the CH-positive material, though cells heavily charged with the material were found sparsely distributed in the area in question. Also the neurosecretory material was rarely found as being distributed along the axons arising from the paraventricular cells, and it was of interest to observe that significantly basophile Nissl area together with perinuclear basophilia were mostly lacking in the constituent cells of the nucleus. It has been admitted that secretory material from the hypothalamic nuclei originates in either or both of the Nissl area and/or the perinuclear basophile area (Scharrer, Palay, and Nilges, 1945, Scharrer and Scharrer, 1945, 1954; Bargmann, 1954), which was recently substantiated by the histochemical study (Bachrach, 1957).

It is not the scope of the present work to get in the analysis of the pending problems of the peripheral vacuoles, red pyknosis, perinuclear clear area, etc., accounts being focused on the productivity of CH-positive material in the said nucleus. In this sense, it could be stated that, so far as the mode of occurrence of CH-positive material was concerned, the present material showed up a marked sign of disturbance of the neurosecretory activity in the paraventricular nucleus.

SUMMARY

Nucleus paraventricularis of a senile woman died of bleeding in the medulla oblongata was histologically examined by means of Gomori’s chrome-alum hematoxylin and phloxine method. Neurosecretory material was rare within the cells of the nucleus, while intracellular vacuoles and perinuclear clear area were observed, and cells with red pyknotic nuclei were occasionally found. Brief comments were made with respect to the present finding with reference to the secretory activity of the nucleus.
REFERENCES