

Preliminary Observations on Changes of Nuclear Volume of Hypothalamic Nuclear Neurons in Thyroidectomized Rats¹

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The nuclear volume (NV) or nucleolar volume of hypothalamic neurons has been reported to change during development⁽⁶⁾, in old age⁽¹¹⁾ and under different endocrine conditions^(1, 8, 12, 13). Thyroid hormone deficiency affects reproductive functions in rats has also been reported repeatedly^(2, 4, 5, 7, 10, 16). In present study the NV of the hypothalamic nuclei of male and female rats two weeks after thyroidectomy (Tx) was measured in order to correlate the morphological changes with the functional changes.

The sham operated (S) and Tx Sprague-Dawley adult male rat, each group contained 5 animals, were sacrificed two weeks after operation. The brains were fixed by 10% formalin/saline perfusion

and serial paraffin sections were prepared 10- μ in thickness, stained with cresyl violet. The long and short diameters of 20 largest neuronal nuclei were measured for each animal in random under light microscope (980X) and calculated by $V = \frac{\pi}{6} ab^2c^{(14)}$ into NV. The treatment in female is the same except the rats were sacrificed on the day of proestrus. The significance of differences was evaluated by Student's t-test.

In male rats, the NV of preoptic area (POA) and suprachiasmatic nucleus (SCN) shows significant difference between S and Tx groups. Meanwhile, the females demonstrate significant differences in POA, SCN, paraventricular nucleus (PVN), anterior hypothalamic area (AHA), ventromedial nucleus (VMN), arcuate nucleus (ArcN) and mammillary body (MN) (Table 1). The declined NV in present study both in male and female after Tx suggests a change in hypothalamic functional status, most possibly, hypofunction which concerned with the reproductive axis as a result of thyroid hormone deficiency.

The NV of POA, SCN, PVN, AHA, VMN, ArcN and MN in female but only POA and SCN in male decreases significantly. It has been

Table 1. The comparison of NV of the hypothalamic nuclei between sham operated and thyroidectomized rats

		POA ⁽¹⁾	SCN	SON	PVN	
Male	{S	297.7 \pm 15.4 ⁽²⁾	120.1 \pm 7.7	230.5 \pm 16.7	371.1 \pm 55.3	
	{Tx2	252.8 \pm 8.3*	97.0 \pm 6.2*	221.3 \pm 7.3	274.2 \pm 21.9	
Female	{S	628.7 \pm 29.6	195.6 \pm 13.9	391.5 \pm 38.7	563.2 \pm 75.2	
	{Tx2	411.0 \pm 16.6 ⁽³⁾ **	142.8 \pm 13.3*	336.2 \pm 16.2	340.5 \pm 17.8*	
		AHA	VMN	DMN	ArcN	MN
Male	{S	223.6 \pm 16.8	299.0 \pm 23.2	166.8 \pm 8.4	139.5 \pm 8.5	251.9 \pm 12.0
	{Tx2	201.9 \pm 26.8	237.4 \pm 17.5	132.2 \pm 18.1	132.7 \pm 12.5	213.8 \pm 12.9
Female	{S	533.9 \pm 52.3	569.3 \pm 35.1	307.2 \pm 21.3	244.2 \pm 6.8	503.7 \pm 36.0
	{Tx2	377.3 \pm 35.2	402.7 \pm 11.6 ⁽³⁾ **	295.0 \pm 26.2	191.0 \pm 8.8 ⁽³⁾ **	384.9 \pm 23.3 ⁽³⁾ **

1. Abbreviations: Preoptic area (POA), Suprachiasmatic nucleus (SCN), Supraoptic nucleus (SON), Paraventricular nucleus (PVN), Anterior hypothalamic nucleus (AHA), Ventromedial nucleus (VMN), Dorsalmedial nucleus (DMN), Arcuate nucleus (ArcN), Mammillary body (MN). S: sham operation Tx2: two weeks after thyroidectomy

2. Mean \pm standard error of the mean (SEM).

3. Student's t-test. * significant at $P < 0.05$. ** significant at $P < 0.01$. as Compared with S group

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proposed that POA-SCN is responsible for cyclic release and ArcN-VMN for tonic release of gonadotropins⁽⁸⁾ in rat. The evidently decreased hypothalamic LHRH⁽¹⁵⁾ may be the result of the declined NV as the consequence of declined activity in the LHRH producing areas which are POA, SCN, AHA, PVN, VMN and ArcN⁽⁹⁾. Hagino⁽⁷⁾ indicated that an optimal amount of T₄ present in CNS is crucial to maintain normal reproduction in rats. The significantly decreased NV of POA and SCN in male could mean the more specific effect of thyroid hormone deficiency on anterior hypothalamus. Further investigation is in progress.

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甲狀腺切除鼠下視丘神經核核容積改變之初步觀察

劉素瑩 萬家茂

雄鼠下視丘核容積於甲狀腺切除二週後與假手術組比較，視前區(POA)及視交叉上核(SCN)有明顯下降，雌鼠經相同處理後視前區、視交叉上核、室旁核(PVN)、下視丘前區(AHA)、腹內核(VMN)、弓狀核(ArcN)和乳頭體(MN)亦有顯著的下降，甲狀腺素不足可能經由下視丘性釋放激素(LHRH)區神經細胞活性之改變而影響生殖。