Comparison of relative weight and cell volume of SC and SG between SHR and WKY

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Introduction: We have studied the functional state of superior cervical ganglionic (SCG) and stellate ganglionic (SG) cells of SHR in early prehypertensive stage by light microscopic autoradiography with $^3$H-lysine and $^3$H-dehydroxyphenyl alanine. The number of silver grains over the perikarya of ganglion cells in both ganglia of SHR was larger than that in WKY. However, there are no previous papers studying the relative weight of ganglion, and the ganglion cell volume of SHR in early prehypertensive stage.

Materials and Methods: 1. Relative weight of ganglia: The animals used were 0-, 10-, and 30-day-old male SHR and WKY. SCG and SG were removed from eight animals of each age and species were weighed. And relative weight of both ganglia was calculated.

2. Ganglia cell volume: The animals used were 0-, 10-, and 30-day-old male SHR and WKY. Six animals of each age and species were fixed by intracardiac perfusion, and left SCG and SG were removed. After the tissue blocks were embedded in Epon resin, sections (1μm thickness) were cut with a ultramicrotome at central part of ganglia and stained with toluidine blue. Whole ganglion in the sections were photographed and volume of all cells with a distinct nucleolus was calculated in photographic enlargement at a final magnification of 1400 by the Texture Analyse System (Leitz). Cell volume of SCG and SG was compared between SHR and WKY in each group by drawing histograms. Means of the cell volume of SCG and SG were calculated in each group, and compared between SHR and WKY.

Results: 1. The relative weight of left SCG at 0-day-old, and of both right and left SCG at 10 and 30-day-old were significantly larger in SHR than those of WKY (p<0.01). The relative weight of SCG of both side at 10 and 30 days of age were significantly larger in SHR than those of WKY (p<0.01).

2. In the histograms of the cell volume, SCG cells of 0 and 10-day-old SHR showed the highest frequency between 146μm$^3$ and 219μm$^3$, and between 437μm$^3$ and 510μm$^3$, while those of age match WKY did between 73μm$^3$ and 140μm$^3$, and between 219μm$^3$ and 292μm$^3$, respectively. Histograms of SHR shifted to the right, larger side, comparing with those of WKY at both ages. At 30-days of age, however, there were no significant differences in SCG cell volume between SHR and WKY.

The mean of all volume of SCG and SG cells was significantly larger in SHR than in WKY at 0 and 10-day-old (p<0.01), but not at 30-day-old in both ganglia.

Discussion: The relative weight of SG and SCG of 10 and 30-day-old SHR were significantly larger than those of WKY, and the cell volume of both ganglion were also larger in 0 and 10-day-old SHR than those of WKY.

This suggests that the peripheral sympathetic nervous system in SHR of prehypertensive stage is in a state of hyperfunction and that hyperfunction of the peripheral sympathetic nervous system seems to be an important factor in the development of hypertension in SHR.