9) Analysis on the Vectorcardiographical Pattern of SHR at Various Ages. Yukio Yamori⁺, Masahiro Kihara⁺, Ryoichi Horie⁺, Yasuo Nara⁺ and Akira Ooshima⁺. Department of Pathology*, Shimane Medical University, Japan Stroke Prevention Center⁺, Izumo 693.

INTRODUCTION

Yamori et al applied the Takayasu vectorcardiographical [VCGcal] lead system to spontaneously hypertensive rats (SHR), and Wistar-Kyoto rats (WKY), and not only succeeded in obtaining a more reproducible electrocardiograph (ECG) and VCG than other methods in rats, but also showed that SHR had unique VCGcal features compared with those of WKY (JAP CIRCUL J 40:1315, 1976). Among several features in VCG of SHR, the most characteristic one is a left upward deviation of the maximum QRS vector in the frontal plane which is detected even in prehypertensive 1-month-old SHR. In the present study, male SHR, SHRSP and WKY, more than 100 of each, were examined at the age of 30 days and thereafter, to investigate the change of VCG pattern by aging in relation to the development of hypertension.

MATERIAL AND METHOD

Male SHR, SHRSP and WKY, 108, 135 and 119, respectively, at the age of 1, 2, 3-4, 6-9 months and over 9 months, maintained at Japan Stroke Prevention Center, were examined. VCG and ECG by orthogonal X-, Y- and Z-leads were recorded under light Nembutal anesthesia (30 mg/kg) as previously described, and magnitudes and angles of maximum QRS vectors in frontal (F), left sagittal (LS) and horizontal (H) planes and the voltage of several components R, S and S-T segment in X-, Y- and Z-leads were measured. Blood pressure (BP) was measured by a tail-pulse-pickup method.

RESULTS

1. BP: In 1 and 2-month old WKY, BP were 111 ± 3 (M $\pm$ SE) and 121 ± 8 mmHg, respectively, and remained stable thereafter. In 1-month old SHRSP and SHR, BP were 139 ± 3 and 127 ± 2 mmHg, respectively, and exceeded 190 mmHg over the age of 2 months.

2. ECGcal observation: In SHR and SHRSP R waves were significantly lower in X- and Y-leads, and the bottom of S-T segment in X-lead and S wave in Y-lead were also significantly deeper than those in WKY as shown in Table.

3. VCGcal observation: "SHR pattern" was defined as VCG with a minus angle in maximum QRS vector in F plane, and "WKY pattern" as VCG with an angle of maximum QRS vector less than $+80^\circ$ in F plane, with the height of R wave in X-lead greater than the depth of S wave in Y-lead and a plus angle of maximum QRS vector in LS plane. Patterns which were excluded from either of them were classified as "others". (1)in WKY most frequently observed patterns were WKY patterns, 50, 91 and 94% at the age of 1, 3 and 6-9 months, respectively. (2)in SHRSP, typical SHR patterns were most frequent, 50, 70 and 74% in 1, 3 and 6-9 month-old rats. (3)in SHR the incidence of SHR pattern was intermediate between SHRSP and WKY. In SHR and SHRSP there was a tendency SHR patterns were increased with aging.

SUMMARY AND DISCUSSIONS

A marked difference in ECG and VCG patterns of SHR and SHRSP from those of WKY was noted even at the prehypertensive stage, suggesting that this might be of hereditary alteration and possibly an index of the genetic predisposition of hypertension. However, since SHR patterns increase with aging, further study is needed to exclude the secondary effect of hypertension.

Age (months)	Strain (number)	Voltages (mV) in ECG					
		X		Y		Z	
		R	S-Tseg	R	S	R	S
1	WKY(12)	1.82 ± 0.19	-0.13 ± 0.07	1.16 ± 0.07	-0.77 ± 0.12	1.28 ± 0.16	-0.08 ± 0.07
	SHRSP(36)	$0.60 \pm 0.06^{**}$	$-1.22 \pm 0.04^{**}$	1.22 ± 0.04	$-1.07 \pm 0.07^*$	1.01 ± 0.07	-0.10 ± 0.08
3	WKY(16)	0.95 ± 0.06	-0.15 ± 0.03	0.87 ± 0.04	-0.42 ± 0.03	0.90 ± 0.06	-0.45 ± 0.05
	SHRSP(25)	$0.45 \pm 0.07^{**}$	$-0.37 \pm 0.06^{**}$	$0.63 \pm 0.03^{**}$	$-0.88 \pm 0.08^{**}$	0.77 ± 0.07	-0.45 ± 0.10
6	WKY(20)	1.08 ± 0.08	-0.15 ± 0.04	0.82 ± 0.07	-0.25 ± 0.06	0.71 ± 0.08	-0.41 ± 0.07
	SHRSP(30)	$0.70 \pm 0.08^{**}$	-0.24 ± 0.03	$0.51 \pm 0.04^{**}$	$-0.76 \pm 0.07^{**}$	0.54 ± 0.07	-0.62 ± 0.13

Statistical significance from WKY *:p<0.05, **:p<0.02, ***:p<0.01, ****:p<0.001