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Prediction of masked uncontrolled hypertension with left ventricular hypertrophy

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Objectives: Ambulatory blood pressure monitoring (ABPM) is the most reliable and precise measurement in diagnosing hypertension. We hypothesized that masked uncontrolled hypertension (MUCH) may be more prevalent in individuals with electrocardiographically left ventricular hypertrophy and normaloffice blood pressure (BP). To prove the hypothesis, we investigated the association between electrocardiographically left ventricular hypertrophy (LVH) and MUCH detected by ABPM in individuals with normal office BP.

Methods: We conducted retrospective study for 77 subjects who received electrocardiography (EKG) and ABPM from 2018 to 2019 year in Veterans Healthcare Service Medical Center. Electrocardiographic LVH was defined as the length of S wave in V1 (S_{V1}) + the length of R wave in V5-6 (R_{V5-6})≥35 mm. MUCH was determined by 24 hour mean BP≥130/80 mmHgin ABPM and normal office BP (<140/90 mmHg). Subjects were divided into 2 groups of non-LVH group and LVH group. Independent T-test and Chi-square test were conducted to compare the clinical characteristics of subjects between two groups. Correlation analysis was performed to identify the relationship between EKG and ABPM. Logistic regression analysis was used to evaluatethe association MUCH and other factors.

Results: The number of subjects in non-LVH group and LVH group was 42 (54.5%) and 35(45.5%), respectively.LVH group manifested the lower prevalence of DM, lower BMI and higher creatinine level. Proportions of MUCH and nocturnal hypertension were higher in LVH group than non-LVH group (Table 1). In correlation analysis, night-time systolic BP showed the positive correlation with S_{V1}+ R_{V5-6} (r=0.282, p value=0.014) and R_{V5-6}(r=0.320, p value=0.005), and night-time diastolic BPwas positively correlated with S_{V1}+R_{V5-6}(r=0.293, p value=0.010), R_{V5-6}(r=0.268, p value=0.019). Logistic regression analysis indicated that LVH was significantly associated with MUCH (3.3 [1.2-9.3]) (Table 2).

Conclusions: Electrocardiographically detected LVH was significantly associated with MUCH.These findings suggest that ABPM may be potentially useful in detecting MUCH among individuals with normal office BP and electrocardiographic LVH.

table1

Table 1. Comparison between non-LVH groups and LVH group

	Non-LVH group (N=35)	LVH group (N=42)	P value
Age (year)	74.0 ± 9.3	76.4 ± 8.1	0.220
Male N, (%)	74.3	85.7	0.207
DM N, (%)	22, (62.9)	16, (38.1)	0.040
Cardiovascular event N, (%)	20 (58.8)	18 (42.9)	0.249
Office SBP (mmHg)	126.6 ± 9.5	123.8 ± 11.3	0.255
Office DBP (mmHg)	68.9 ± 8.5	67.9 ± 7.8	0.597
Cr (mg/dL)	1.19 ± 0.67	1.70 ± 1.19	0.026
eGFR (ml/min/1.73m^2)	58.5 ± 26.1	49.4 ± 23.9	0.123
S wave in V1 (mm)	7.1 ± 3.8	12.4 ± 4.5	0.000
R wave in V5-6 (mm)	17.7 ± 4.8	27.6 ± 4.6	0.000
BMI (Kg/m^2)	26.0 ± 3.1	23.6 ± 2.7	0.001
24hr mean SBP (mmHg)	126.2 ± 15.1	128.8 ± 12.2	0.410
24hr mean DBP (mmHg)	75.7 ± 11.0	76.8 ± 7.5	0.608
Day SBP (mmHg)	128.3 ± 15.1	128.6 ± 12.0	0.935
Day DBP (mmHg)	77.7 ± 11.4	77.4 ± 7.6	0.906
Night SBP (mmHg)	121.3 ± 18.0	129.7 ± 15.8	0.033
Night DBP (mmHg)	71.2 ± 11.0	75.8 ± 9.2	0.055
24hr mean HTN N, (%)	14 (40.0)	27 (64.3)	0.041
Daytime HTN N, (%)	13 (37.1)	16 (38.1)	1.000
Nocturnal HTN N, (%)	22 (64.7)	37 (88.1)	0.025

table2

Table 2. The Odds (OR) and 95% confidence intervals (CI) of masked uncontrolled hypertension and nocturnal hypertension

	Masked uncontrolled hypertension		Nocturnal hypertension	
	Unadjusted OR (95% CI)	Multivariate OR (95% CI)	Unadjusted OR (95% CI)	Multivariate OR (95% CI)
LVH	2.7 (1.1-6.8)	3.3 (1.2-9.3)	4.0 (1.3-13.0)	5.1 (1.4-18.5)

*Adjusted with age, sex, and BMI