



Study on ECG Changes in Chronic hypertensive Patients in a Medical College Hospital of Odisha

Authors

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ABSTRACT

Aims: Aim of this study was to analyze and compare the variations and abnormalities in ECG wave forms among people with chronic hypertension and controls.

Methods: The study was conducted in Hi-Tech Medical College & Hospital, Bhubaneswar during the period from Sept 2013 – Aug 2015. The study included 50 people with chronic hypertension and 50 controls, each between ages 40-70 years from general population, and also from Medicine outpatient department, HMC&H, Bhubaneswar. Following an explanation about the nature and purpose of study, those subjects who are willing to participate were included after obtaining their consent. Subjects with exclusion criteria were dropped. Detailed history from subjects, blood pressure (sitting position) and electrocardiogram was recorded during resting state in supine position. The ECG results were evaluated for parameters like heart rate, P wave, PR interval, QRS complex, QRS axis, QT interval, QTc interval, ST segment and T wave.

Results: There was statistically significant increase in QT interval & QTc interval in chronic hypertensives than controls. There was increased occurrence of LVH, ST depression and T wave inversion in chronic hypertensives than controls.

Conclusion: This study shows that chronic hypertension is associated with QT prolongation. Most frequently occurring ECG abnormalities in chronic Hypertension are LVH, ST depression and T wave inversion.

Keywords: Chronic hypertension; left ventricular hypertrophy, QT prolongation, ST depression, T wave inversion.

INTRODUCTION

Hypertension is the single most preventable cause of death according to the WHO. Chronic hypertension causes stiffening of arteries. Increased stiffness of large arteries leads to early wave reflection, increasing peak systolic pressure and myocardial oxygen demand, while decreasing myocardial blood supply. Electrocardiogram is the

first line tool to recognize & diagnose these changes. Different ECG changes like Left Ventricular Hypertrophy, ST segment depression, Abnormal T waves, pathological Q waves, prolonged QRS complex etc has been frequently observed in chronic hypertensive patients. Hence, the present study is being undertaken to study of ECG changes in people with chronic hypertension

in Odisha population and thereby creating awareness among people.

METHODS

Our study was a prospective study. It was conducted in the department of Physiology, Hi-Tech Medical College & Hospital, Bhubaneswar, Odisha during the period from Sept 2013 – Aug 2015. The aim of the study was to compare the variations and abnormalities in ECG wave forms among people with chronic hypertension and controls. The study included 50 subjects (chronic hypertensives) and 50 normotensive controls. Case group was selected from Medicine OPD & Casualty of Hi-Tech Medical College & Hospital, Bhubaneswar.

Individuals of age group 40-70 years (a) with past H/O hypertension for at least last 18 months with or without antihypertensive medications or (b) with SBP 160 mmHg or more and/or DBP 100 mm Hg or more measured at resting condition in supine posture were selected as cases. Patients with Diabetes Mellitus, COPD/Asthma, Thyroid disorder, any other acute illness, known history of congenital, valvular, infective heart disease, myocardial infarction, cardiomyopathy, heart failure, 3rd degree heart block were excluded from the study. Normotensive healthy individuals of age group 40-70 years without history of any significant medical and surgical illness were selected as controls from odisha general population. All the subjects were explained about the nature and purpose of the study. A detailed history was taken about their lifestyle, past history, family history, presence of other co-morbid conditions and list of medications. Physical examination included measuring Height in cm, weight in kgs, recording resting pulse rate by palpating radial artery and blood pressure recording with a mercury sphygmomanometer. Detailed examination of cardio vascular and respiratory systems was done. Following detailed assessment of the subject, a 12 lead electrocardiogram was recorded during the resting

state using BPL Cardiart 6208 View[®] ECG machine.

ECG was evaluated for different parameters like heart rate, P wave, PR interval, QRS complex, QRS axis, QT interval, QTc interval, ST segment and T wave and results were drawn. ECG abnormalities were interpreted according to advanced Minnesota code and compared between two groups. These included sinus tachycardia, sinus bradycardia, premature ventricular contractions (PVC), atrial fibrillation, left bundle branch block, right bundle branch block, 1st /2nd degree atrio-ventricular block, right atrial and left ventricular enlargement, left and right ventricular hypertrophy, ST segment elevation or depression, T-wave inversion.

STATISTICAL ANALYSIS

The results were expressed as mean \pm SD. Two-tailed P values less than 0.05 were considered statistically significant. Differences between cases and the control subjects were analyzed using the unpaired t test. SPSS 11 for Windows statistical package was used for statistical analysis.

RESULTS

There was statistically significant increase in QT interval and QTc interval among chronic hypertensives compared to controls (Table 1 & Graph 1). Most frequently found ECG abnormalities in chronic hypertensives were Left ventricular hypertrophy (LVH), ST segment depression, Left bundle branch block (LBBB) and T wave inversion (Table 2). In comparison with controls, these changes were statistically significant.

Table 1: Comparison of quantitative ECG parameters b/w chronic hypertensives and controls

Quantitative ECG Parameters	Chronic Hypertensives	Controls	P value
Mean PR interval(sec)	0.15 ± 0.009	0.145 ± 0.011	0.0145
Mean QRS interval(sec)	0.08 ± 0.018	0.083 ± 0.018	0.406
Mean QT interval(sec)	0.40 ± 0.03	0.38 ± 0.03	0.001
Mean QT c interval(sec)	0.45 ± 0.03	0.428 ± 0.03	<0.001
Mean QRS axis (°)	54.2 ± 10.08	56 ± 9.44	0.359

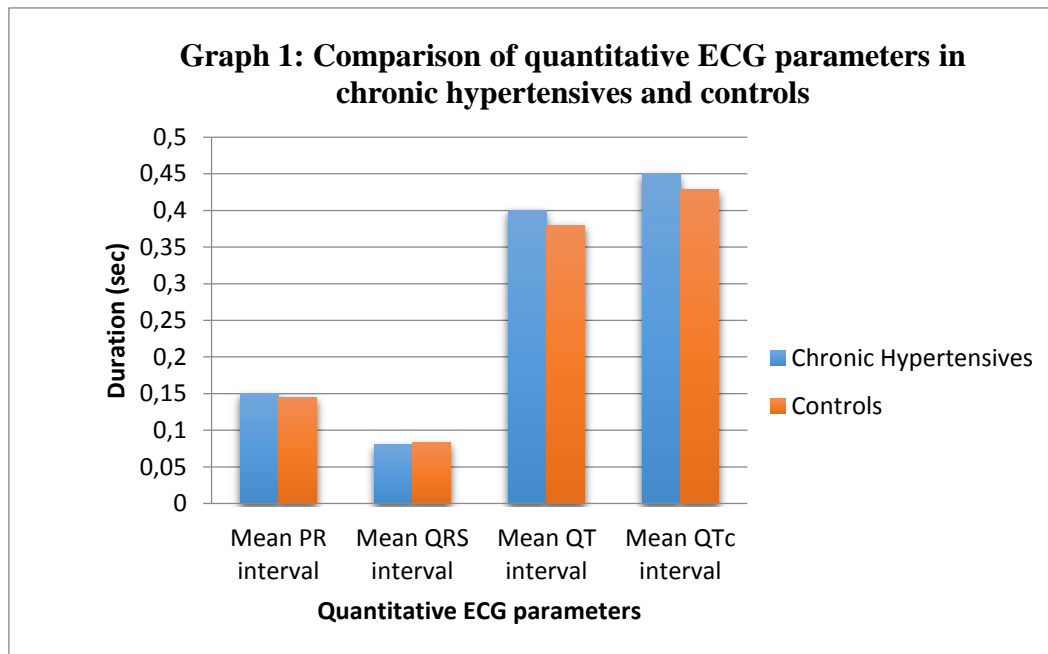


Table 2: Comparison of ECG abnormalities among chronic hypertensives and controls

ECG Abnormalities **	Chronic Hypertensives		Controls		Odds Ratio (95% CI)	P value
	No.	%	No.	%		
sinus tachycardia	3	6	2	4	1.53 (0.24-9.58)	0.64
sinus bradycardia	1	2	4	8	0.23 (0.02-2.17)	0.20
PVC	5	10	3	6	1.74 (0.39-7.71)	0.46
AF	4	8	1	2	4.26(0.45-39.54)	0.20
LBBB	8	16	1	2	9.33(1.12-77.7)	0.03
RBBB	10	20	8	16	1.31(0.47-3.66)	0.60
AV block (1°/2°)	3	6	1	2	3.12(0.31-31.14)	0.33
RAE	1	2	1	2	1.00(0.06-16.44)	1.00
LAE	4	8	2	4	2.08(0.36-11.94)	0.40
RVH	1	2	1	2	1.00(0.06-16.44)	1.00
LVH	20	40	2	4	16(3.48-73.41)	<0.001
ST elevation	1	2	0	0	3.06(0.12-76.95)	0.49
ST depression	12	24	1	2	15.47(1.92-124.3)	0.01
T wave inversion	6	12	0	0	14.75(0.8-269.3)	0.06

(** More than one ECG diagnosis per patient is possible.)

AF= Atrial fibrillation, AV block = atrioventricular block, CI = confidence interval, LAE=left atrial enlargement, LBBB = left bundle branch block, LVH = Left ventricular hypertrophy, PVC = premature ventricular contraction, RBBB = right bundle branch block, RAE= right atrial enlargement

DISCUSSION

Epidemiological studies demonstrate a continuous, consistent, linear relationship between blood pressure and cardiovascular disease.^{1,2} In the INTERHEART study, hypertension accounted for 18% of the population attributable risk for a first myocardial infarction.³ In The Prospective Studies Trialists' collaboration, each incremental increase in systolic blood pressure of 20 mm Hg, and diastolic blood pressure of 10 mm Hg resulted in the doubling of CHD risk.⁴ A study by Okin PM et al⁵ showed that ECG strain pattern of ST depression and T-wave inversion is strongly associated with left ventricular hypertrophy (LVH) in hypertensive patients. Another study in Italy⁶ showed that 15% of patients with mild-to-moderate hypertension, experience episodes of ST-segment depression during Holter monitoring. Stojanovic MM et al⁷ showed in a study that the prevalence of silent ischaemia was markedly increased amongst hypertensive patients. Akdeniz B et al⁸ showed the possible association of hypertension with high risk of potentially malignant ventricular arrhythmias in their study.

CONCLUSION

Our study shows that chronic hypertension is associated with QT prolongation of ECG. Most frequently found ECG abnormalities in chronic hypertensives were Left ventricular hypertrophy (LVH), ST segment depression, Left bundle branch block (LBBB) and T wave inversion. Long standing hypertension causes hypertrophy of heart especially left ventricular enlargement which leads many adverse outcomes including cardiac ischaemia as which ultimately lead to overt heart failure. Hence, utmost precaution and widespread awareness among people is required to maintain optimal blood pressure from the very initial time of diagnosis. Also, regular follow-up and medications are required for longevity and physical well-being. Although our study is by no means exhaustive, it does provide a glimpse into variety of ECG changes in absence of any cardiac disease in chronic hypertensive patients. Further

study is required to evaluate the effects of hypertension on electrocardiogram.

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