Research Article

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EFFECTS OF WALKING ON ECG (ELECTROCARDIOGRAM) PARAMETERS IN HYPERTENSIVE INDIVIDUALS

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ABSTRACT
The aim of this study was to rule out the hypertensive individuals and to observe the effect of 30 minutes brisk walk for one month on ECG parameters. The ECG is often used as an inexpensive, early and fast screening tool to measure target organ damage in hypertensive individuals. Benefits of brisk walking also extend to people at risk for high blood pressure. An increase in aerobic physical activity should be considered an important component of lifestyle modification for prevention and management of high blood pressure. All these cases of Hypertension were registered from Kayachikitsa O.P.D., IMS, BHU, for the duration of Jan 2009 to Jan 2011 and some healthy individuals were enrolled from the Kashi Mumukshu, Bhavan, Assi and Varanasi, India. The selection was random irrespective of sex, occupation and socioeconomic deliberation. All the patients and healthy subjects belonged to age group of 35 to 65 years. One follow up has been carried out during the research work i.e. initially and after one month. Duration of exercise has been prescribed 30 minutes walking. These subjects were demonstrated the scientifically designed exercise protocol and asked to continue these exercises for one month. ECG findings illustrated the decreased heart rate (p < 0.001), RR interval (p < 0.001), QRS interval (p < 0.001), PQ interval (p < 0.001) and ST segment (p < 0.001) in hypertensive exercise groups but this decrease was within normal range. Walking is safe, easy and useful physical activity for cardiac patients with reference to ECG parameters. All the ECG parameters show decreased value within the normal range.
Keywords: Walking, ECG, Hypertension.

INTRODUCTION

Electrocardiograph (ECG) is an important non-invasive, easy and suitable tool for appraisal of myocardial contractility and electrical conduction in the case of hypertensive individuals. Patterns of ECG vary from person to person and even within a person, it varies when exposed to different physiological conditions and physiological activities like walking. Some previous studies of prevalence of ECG findings had been reported. People who had regular walking tend to had low risk of cardiac disease like hypertention.[1-3] Walking is a low-impact, non hazards aerobic exercise that for most people helps their body get fit and improves their circulatory system and heart wellbeing. Electrocardiogram (ECG) remains the basis of cardiovascular diseases in clinical practice because it is universally available, technically easy to perform and highly specific. It is very fast device to rule out basic pathology of heart. ECG is very important analytical tool in hypertension and other cardiac disease[4]. Hypertension is characterized as a progressive cardiovascular syndrome with many causes that result in both functional and structural changes to the heart and vascular system. The early stages of hypertension can begin before an individual develops sustained elevated blood pressure and can progress to damage in the heart, kidneys, brain, vasculature and other organs, often leading to premature morbidity and death.[5] Seventh Report of the Joint National Committee on the Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7) had been published and given in Table below.[6]

Table: JNC 7

JNC 7	SBP (mmHg)		DBP (mmHg)
Normal	< 120	and	< 80
Pre hypertension	120-139	or	80-89
Hypertension			
Stage 1	140-159	or	90-99
Stage 2	≥ 160	or	≥ 100

Walking is highly aerobic and isotonic exercise. Walking, bicycling, walk-jogging and light rowing are usually considered suitable for the uncomplicated cardiac patients and the non-cardiac patient and it reduces the risk of hypertension, hypercholesterolemia and possibly CHD (coronary heart disease).[7] Walking is extremely suited physical activity recommended for inactive persons as it is accessible to men and women of all ages and social groups. It has little risk of injury. It is concerned to recent evidence of the health benefits of walking and promotion of walking behaviour[8]. One possible explanation may be the phenomenon of hypertension-associated hypoalgesia, due to an interaction between the cardiovascular and pain regulatory systems. A combination of antihypertensive medication and lifestyle change resulted in significant reductions in blood pressure but had no significant effect on pain threshold. An alternative explanation is that decreased sensitivity to noxious stimuli may reflect patho-physiological processes that are associated with a genetic predisposition to hypertension rather than a secondary consequence of chronic high blood pressure. Therefore, hypertension-prone individuals may also demonstrate hypoalgesia due to a deficient inhibition of descending central pain modulation pathways. Both preclinical and

clinical studies give strong support to the role of baro receptors in hypertensive hypoalgesia[9].

Assortment of cases

Total 84 (55 males, 29 females) hypertensive cases were enrolled from Kayachikitsa O.P.D.,IMS, BHU and some cases were selected from Kashi Mumukshu Bhavan, Assi (Varanasi), India for the period - Jan 2009 to Jan 2011. The selection of patients was random irrespective of sex, occupation, season and socioeconomic reflection. All the patients belonged to age group of 35 to 65 years. One follow up has been done during the research work, initial and after one month.

Line of action

In the contemporary study, effect of walking has been examined among hypertensive individuals. Isotonic aerobic exercise- walking was prescribed for Hypertensive patients for 1 month. 30 minutes walking has been recommended, before those 5 minutes of warm up and after completion 5 minutes cool down was performed. During entire period of study low caloric and low salt diet was recommended.[10] These subjects were demonstrated the scientifically designed exercise protocol. Our study group was divided as follows:

- HTNC (Hypertensive control) – no exercise performed
- HTNE (Hypertensive exercise) - Performed exercise

Inclusion criteria

Hypertensive patients aged 35-65 years were considered. The patients were of high normal, mild and moderate essential hypertension without any complication. Patients of systolic blood pressure under high normal range above 129 mm Hg and diastolic BP above 84 mm Hg were included. Isolated systolic and diastolic hypertensive cases were also considered.[10]

Exclusion criteria

In both the groups patients aged below 35 years and above 65 years were excluded. Patients suffering from any secondary diseases like Mild/moderate hypertension case with complications such as cerebro-vascular diseases, coronary artery diseases, renal diseases, Cardiac disease, cardiomyopathy and any degree of heart blocks, pre-eclampsia /eclampsia and any psychosomatic disorder were excluded.

Parameters
Electrophysiological profile

ECG was done in Department of Kriya Sharir with advance well equipped 12 channel ECG machine BPL cardiart 6108 T.

OBSERVATIONS AND RESULT

Table 1: Incidence of Gender as per group

SEX	Group			
	HTNC	HTNE	Total	%
Male	21	34	55	65.48
Female	13	16	29	34.52
Total	34	50	84	100

Abbreviations: HTNC, Hypertensive control; HTNE, Hypertensive exercise.

The present work comprised a study of 84 cases. Out of these 84 (55 males, 29 females) patients were hypertensive. (This distribution can be seen from Table 1)

Table 2: Effect of exercise on Heart Rate in different groups

Group	HR (bpm) (Mean ± S.D)		Intra group comparison, Paired t –Test
HTNC (n = 34)	**Initial**	**F1**	**Initial vs F1**
	69.81 ± 6.89	72.16 ± 7.65	t = 4.606 $p<0.001$ (HS)
HTNE (n = 50)	73.22 ± 9.12	70.09 ± 6.94	t=6.208, $p<0.001$ (HS)
Unpaired t – test	I vs II t= 2.081 $p<0.05$ (S)	I vs II t=2.231 $p<0.05$ (S)	

Abbreviations: HTNC, Hypertensive control; HTNE, Hypertensive exercise; HR, Heart rate.

Table 2 showed statistically highly significant ($p < 0.001$) decrease in heart rate in HTNE, group after walking (Isotonic exercise) on I FU and statically highly significant increase was observed in HTNC group on I FU. On Intergroup comparison statistically significant ($p < 0.05$) decrease in Heart Rate between I and II group was observed initially and first follow-up.

Table 3: Effect of exercise on RR interval

Group	RR interval (ms) (Mean ± S.D.)		Intra group comparison, Paired t- Test
HTNC (n = 34)	**Initial**	**F 1**	**Initial vs F1**
	744.45 ± 141.72	751.78 ± 132.76	t= 1.040 p>0.05 (NS)
HTNE (n = 50)	720.90 ± 63.75	656.02 ± 85.21	t=6.208, p<0.001 **(HS)**
Unpaired t – test	I vs II t= 1.023 p>0.05 (NS)	I vs II t=3.959 p<0.001 **(HS)**	

Abbreviations: HTNC, Hypertensive control; HTNE, Hypertensive exercise. RR, Respiratory Rate.

These observations can be concluded from the Table 3 that a statistically highly significant (p < 0.001) change in RR interval was observed in HTNE group after walking (Isotonic exercise). Increase in RR interval was observed in HTNC group at I[st] FU. Intergroup comparison presented statistically highly significant (p < 0.001) decrease in RR interval between I and II on first follow – up.

Table 4: Effect of exercise on QRS interval

Group	QRS interval (ms) (Mean ± S.D.)		Intra group comparison, Paired t- Test
HTNC (n=34)	**Initial**	**F 1**	**Initial vs F1**
	78.71 ± 6.50	79.35 ± 6.97	t= 1.788, p>0.05 (NS)
HTNE (n=50)	73.84 ± 8.48	70.84 ± 6.94	t=7. 316, p<0.001 **(HS)**
Unpaired t – test	I vs II t= 2.736 p<0.001 **(HS)**	I vs II t=4.813 p<0.001 **(HS)**	

Abbreviations: HTNC, Hypertensive control; HTNE, Hypertensive exercise.

A statistically highly significant (p < 0.001) decrease in QRS interval was observed in HTNE group after walking (Isotonic exercise). Increase in QRS interval was observed in HTNC group. Statistically highly significant (p < 0.001) result was observed in both I and II initial and first follow-up. (These observations can be seen from Table 4)

Table 5: Effect of exercise on PQ interval

Group	PQ Interval (ms) (Mean ± S.D)		Intra group comparison, Paired t- Test
HTNC (n = 34)	**Initial**	**F 1**	**Initial vs F1**
	160.32 ± 22.00	168.96 ± 21.71	8.64 ± 11.39 t= 4.223, p<0.001 **(HS)**
HTNE (n = 50)	156.74 ± 17.56	143.98 ± 21.23	12.76±18.66 t=4.835, p<0.001 **(HS)**
Unpaired t – test	I vs II t= 0.819 p>0.05 **(NS)**	I vs II t=5.091 p<0.001 **(HS)**	

Abbreviations: HTNC, Hypertensive control; HTNE, Hypertensive exercise.

As per Table 5, a statistically highly significant (p < 0.001) change in PQ interval was observed in HTNE group after walking (Isotonic exercise). Intergroup comparison reflected statistically highly significant (p < 0.001) change in PQ interval between I and II group first follow-up.

Table 6: Effect of exercise on ST max in different groups

Group	ST max (Mv) (Mean ± S.D.)		Intra group comparison, Paired t- Test
HTNC (n = 34)	**Initial**	**F 1**	**Initial vs F1**
	0.1284 ± 0.0524	0.1458 ± 0.05408	t= 2.147, p>0.05 **(NS)**
HTNE, (n = 50)	0.1526 ± .08020	0.1292 ± 0 .083	t=4.567, p<0.001 **(HS)**
Unpaired t – test	I vs II t= 1.494 p=0.139 (NS)	I vs II t=0.987 p>0.05 (NS)	

Abbreviations: HTNC, Hypertensive control; HTNE, Hypertensive exercise.

Table 6 suggested that a statistically highly significant (p < 0.001) decrease in ST max was observed in HTNE, after walking (Isotonic exercise). Intergroup comparison reflected no statistically significant result interval between I and II group.

Table 7: Effect of exercise on QTC Segment in different groups

Group	QTC (ms) Interval, (Mean ± S.D)		Intra group comparison, Paired t- Test
HTNC	Initial	F1	Initial vs F1
(n = 34)	440.87 ± 64.30	458.29 ± 74.21	t=2.548, p <0.05 **(S)**
HTNE, (n = 50)	403.16 ± 49.51	324.04 ± 49.51	t=7.877, p <0.001 **(HS)**
	I vs II t= 2.967, p<0.01**(HS)**	I vs II t=8.226, p<0.001 **(HS)**	

Abbreviations: HTNC, Hypertensive control; HTNE, Hypertensive exercise.

DISCUSSION

The present work comprised a study of 84 cases. Out of these 84 (55 males, 29 females) patients were hypertensive. In this study hypertension cases were selected. Hypertension is a common psychosomatic disorder now-a-days and ECG is an important investigation in hypertensive individuals to prevent the heart pathology. In present time due to stress, sedentary life style psychosomatic diseases are very common, which affect mind and body. Walking is very effective in this regards. In this study, statically highly significant (p < 0.001) decrease was observed in Heart Rate, RR, QRS, PQ, ST, QTC after walking in hypertensive individuals but all these ECG values were observed within the normal range. Some prior study has showed the same result in relation to some parameters in ECG like PR, QRS and QT interval.[1,11,12] Yet very few studies have been reported in this regard. It has been observed that hypertensive individuals felt less acute pain during root canal treatment after walking

CONCLUSION

Electrophysiological parameters like ECG findings illustrated decreased pattern within normal range after walking. The baseline data can be also helpful in envisaging those individuals may not likely to develop myocardial dysfunction after adaptation of regular walk in their life style. Further research is needed with long term duration of walking with large sample size. There is emergent need to explore this area of study among the more population especially with increasing incidence of cardiovascular diseases to prevent cardiovascular risk.

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