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The Heart Frequency and Its Variability in Hypertensive Patients Considering A/B Type of Behaviour and Eight Basic Emotions and Levels of Anger Expression

Karlo Kožul[1], Ksenija Vidović[1], Helga Heinzelman-Kožul[2], Senka Samardžić[3], Mirta Kopić[4] and Miroslav Šram[5]

[1] Department of Epidemiology, Institute of Public Health for the Osijek-Baranja County, Osijek, Croatia
[2] Specialist in Family Medicine Practice
[3] Department of Social Medicine, Institute of Public Health for the Osijek-Baranja County, Osijek, Croatia
[4] Department of Ophthalmology, University Hospital »Osijek«, Osijek, Croatia
[5] Clinic for Internal Medicine, University Hospital »Osijek«, Osijek, Croatia

A B S T R A C T

The aim of this paper was to comparation between autonomic regulation of the heart rate and it's variability within 100 essential hypertensive patients and 100 examinees in healthy control group. Essential hypertensive patients had significantly shorter average RR interval, that is, faster heart frequency then the control group. Average variability of the heart frequency was statisticaly considerably lower in hypertensive than in the healthy control group. Sistolic blood pressure, diastolic blood pressure, duration of hypertension, levels have considerate total influence on heart frequency and it's variability during calm and during deep breathing. The most distinctive negative connection was found between variability of the heart frequency and duration of hypertension. The type A behaviour within hypertensive patients and the control group was more common then type B. In the hypertensive group, total influence of all independent Bortner's variables on to variability of the heart frequency during calm breathing was statisticaly important. Within hypertensive patients and the control group, the heart frequency and it's variability were connected with eight basic emotions. In the group of hypertensive patients variability of the heart frequency is significantly positively connected with emotional dimension »Incorporation«, but negatively with emotional dimensions »Protection«, »Rejection« and »Reproduction«. Our data showes that patients with long-term hypertension have increased heart frequency and reduced variability of the heart frequency, which are well-known risk factors for increased cardial mortality.

Key words: *hypertensive patients, A/B type of behaviour, basic emotions*

Introduction

It is estimated that 15–20% of adult population in industrialized high-developed countries, as well as in Croatia[17] in the world have high blood pressure[16]. For adults, hypertension is considered to be with sistolic blood pressure equal or higher than 21.3 kPa, and/or diastolic equal or higher then 12.0 kPa. Untreated hypertension increases appearance of heart failure, coronary heart disease, haemorhagic and trombothic stroke, renal insuficiency, aortal dissection and death[2–5]. Diagnosed hypertension is psychological and socioeconomical burden to a patient because it almost always demands life-long therapy[8–10]. In arterial hypertension, the heart, at first, shows signs of hyperkinetic syndrome. The heart frequency is normally determined by early diastolic depolarization of the nodus sinoatrialis (heart automatism), function of the automatic nervous system, body temperature, thyroid hormones, metabolism, chatecolamines and neurotransmiters[22]. Numerous studies confirmed that average heart

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frequency is considerably higher in hypertensive then in those normotensive individuals, however it's not significantly connected to hypertensive cardiomyopathy[28].

Emotional state, i.e. neurogenic factors, affect many functions of cardiovascular system. Heart frequecy, blood pressure, peripheral blood vessels succumb to quick changes due to stimulus from autonomic nervous system[32,33]. There are two types of behaviour, A and B[34]. Fully developed typ A connotes readiness, impatience, intolerance, agresive and hostile attitude, competitive spirit and constant personal ambition. In other words, type A is emotional complex that can be attributed to individuals in constant struggle to accomplish as much as they can in the shortest of time, or they are in constant conflict with people from their surroundings. Unlike this, type B is mostly released of this features, has no conflict with time and people, therefore no hostility.

According to Plutcnik, there are eight basic or primal emotions which are foundation for reactions of adults. 3 positive emotions are: acceptance (incorporation), joy (reproduction), anticipation (exploration), and 5 negative are, disgust (rejection), sadness (deprivation), fear (protection), surprize (orientation) and anger (destruction). They have adaptational meaning for survival of individuals.

The purpose of our study was to analize autonomic regulation of heart function in relation to type of behavior, eight basic emotions and Minesota scale anger through frequency and it's variability in hypertensive patients compared to healthy individuals.

Material and Methods

This study was performed at the cardiovascular infirmary of Internal Clinic in Clinical Hospital Osijek, with the approval oft he hospital Ethical Committee. For the group of examinees we chose only those hypertonics in which we did not found detectable secundary reason of high blood pressure and it's complications. Hypertensive patients with angina pectoris, myocardial infarction, valvular heart disease, congestive heart disease, diabetes mellitus, renal insufficiency, opstructive lung disease and musculosceletal disorder had been excluded from the research. One hundred examinees, 40 men of average age of 47.1 ± 8.6 years old and 60 women of average age of 50.7 ± 7.0 years old made the hypertensive group. A control subjects were matched by gender, age and marital state from the normotensive healthy individuals who visited Internal Clinic or Institute of Public Health Osijek for some other reason. Every examinee, gave detailed medical anamnesis, physical status was taken, blood pressure, height and weight were measured, also body mass index was calculated.

After laying down and resting for 15 minutes, 12 lead electrocardiograph and paper rhythm of 100 R-R intervals (variability of the heart frequency) has been recorded during calm slow breathing and deep breathing. R-R intervals have been measured in order, with a pair of compasses. The variability of R-R intervals (variability od heart frequency) was expressed by coefficient of variability (CV) for 100 R-R intervals during calm and during deep breathing. By definition, deep breathing is a state in which a patient breathes freely and as deep as possible, with a frequency of 6 inhales per minute[44].

Each examinees filled in Bortner's scale to determine a type of behaviour, A or B with a physician's help,. Maximum score is 336 points. Total count of 169 to 336 points have individuals that belong to A type behaviour, while 168 or less points indicate a person with B type behaviour[45,46]. Also an EMOTIONS PROFILE INDEX (EPI) according to Plutchik was made for every examinee. That is an personality test formed to give informations about basic personality types and intrapersonal conflicts in life of every individual[47]. It' s composed of 12 terms which are joined in pairs in every possible combination. So, we get 62 tasks in which an examinee is » forced« to chose one term in pair which describes him the most. For example, »Is he more shy or dispirited?«. Selection is marked in a sence of emotions which are implied in chosen word, for example, shyness implies fear, while consternation implies sadness. Rough results of emotional dimension are expressed through frequentional table whithin adequate percentage for every emotional dimension. This test measures intensity, analogy and bipolarity of eight basic emotions. Intensity of an emotion is shown with a scale from 0 to 100%. Percentage beyond 60% is considered high, and one below 40% low.

An exsaminee' s anger level control was tested with Minnesota multiphasal personal scale of anger expression. That is a question-form with 16 statements on which are answered with »yes« or »no«. If the number of affirmative answers is lower, examinees are better in control of their anger. So, lower rating anger is represented with 0–1, middle rating 2–4, higher rating 5–16 affirmative answers[50,51].

Statistical analysis

Data are represented as average value and standard deviation. Statistical significance was determined by Student's t-test between groups, variance analysis and χ^2 test. Mutual cohesion between variables were determined by linear correlation coefficient (rxy=SDxy/SDxSDy). Cohesion strength in between of depended variable and independent variables was determined by multiple regresion coefficient and beta coefficient. Statistical importance of results was defined on the level $p<0.05$.

Results

Heart frequency and it's variability during calm and deep breathing

Within the group of hypertonics, during calm breathing, average R-R interval was shorter, that was higher heart rate then within control group (758.7 ± 29.3 ms opposite 824.9 ± 38.4 ms), which was of statistical importance (t-test = –4.031, df = 99, $p<0.05$). Equally, average frequency variability was statistical distinctively lower in

the group of hypertonics, than in the control group (t-test = –2.394, df = 99, $p<0.05$).

During deep breathing R-R interval was shorter than in calm breathing. The heart frequency was higher in the group of hypertonics than in control group (726.7 ± 40.3 ms opposite 779.0 ± 49.5 ms), what was also of statistical importance (t-test = –3.507, df = 99, $p<0.05$). Equally, average frequency variability was statistical distinctively lower in the group of hypertonics, than in the control group (t-test = –2.095, df = 99, $p<0.05$).

Somatic factors and their correlation with heart frequency ant it's variability

An average weight within the group of hypertonics was 80.0 ± 15.1 kg, and within the control group was 70.5 ± 11.6 kg, which is of statistical importance (t-test = 4.97, df = 198, $p<0.05$). An average height in hypertonics was 170.3 ± 8.8 cm, and within the control group was 170.3 ± 8.5 cm. Body mass indeks (BMI) in the group of hypertonics was 27.4 ± 3.8 kg/m^2, and in the control group was 24.2 ± 3.1 kg/m^2. That difference had statistical importance (t-test = 6.44, df = 198, $p<0.05$).

75 examinees from the group of hypertonics and 51 examinees from the control group had positive family history for hypertension, which made statisticaly important difference ($\chi^2 = 11.35$, df=1, $p<0.05$).

A connection between length of average R-R interval, during calm and during deep breathing and coefficient of variability (CV) of R-R interval (heart frequency variability) with altitude of sistolic and diastolic blood pressure and duration of hypertension had been tested with multiple regresion analysis in the group of hypertonics. We found that total influence of independent variables on R-R interval length in calm (multiple regresion coefficient R = 0.569, $p<0.05$), and in deep breathing (multiple regresion coefficient R = 0.558, $p<0.05$) was statisti-

TABLE 1
A CORRELATION BETWEEN R-R INTERVAL AND COEFFICIENT OF VARIABILITY (CV) OF R-R INTERVAL AND SOME HEALTH PARAMETERS AND LAB RESULTS IN HYPERTENSIVE PATIENTS

Health parameters	Beta-coefficient of R-R interval		Beta-coefficient of CV R-R interval	
	calm breathing	deep breathing	calm breathing	deep breathing
Sistolic heart pressure	0.063	0.082	–0.038	–0.047
Diastolic heart pressure	0.009	–0.063	0.012	0.038
Duration of hypertension	–0.206	–0.218	–0.041	–0.291
Multiple regresion coefficient	0.569	0.558	0.989	0.975

TABLE 2
A CONNECTION BETWEEN R-R INTERVAL AND COEFFICIENT OF VARIABILITY (CV) OF R-R INTERVAL AND TYPE OF BEHAVIOUR ACCORDING TO BORTNER IN THE CONTROL GROUP

Bortner scale (type of behaviour)	Beta coefficient of R-R interval		Beta coefficient of CV of R-R interval	
	calm breathing	deep breathing	calm breathing	deep breathing
Punctuality	0.058	0.074	0.145	0.113
Competitive spirit	0.151	0.041	–0.238	–0.194
Disobedience	–0.114	–0.024	0.147	0.153
Haste	–0.038	0.068	0.105	0.305
Impatience	0.079	0.065	0.003	–0.086
Insecurity	0.099	0.014	0.257	0.225
Doing several things simultaneously	–0.166	–0.179	–0.139	–0.189
Impetuosity	0.252	0.324	0.109	–0.085
Wish for acknowledgement	0.053	–0.072	0.153	–0.023
Promptitude	0.109	0.128	–0.050	–0.263
Tension	–0.453	–0.508	–0.249	0.147
Expression of emotions	–0.257	–0.314	–0.051	0.221
Several intrest	0.182	0.031	–0.223	–0.222
Ambition	–0.086	–0.004	0.036	0.181
TOTAL	–0.222	–0.200	0.015	0.088
Multiple regression coefficient	0.474	0.561	0.363	0.415

caly important. Also, effect of all independent variables on coefficient of variability (CV) of the R-R- interval (variability of the heart frequency) during calm breathing was statisticaly important (multiple regresion coefficient R = 0.989, $p<0.05$), Coefficient of variability (CV) of the R-R interval during deep breathing was also statisticaly important and negative connected with duration of hypertension (beta =–0.291, $p<0.05$). A total influence also showed statistical significance (multiple regresion coefficient R=0.975, $p<0.05$) (Table 1).

Types of behaviour and their connection with heart frequency and it's variability

In the group of hypertonics A type behaviour was present whithin 63 examinees, and in the control group within 69 examinees (no statisticaly important difference).

A connection between average R-R interval during calm and during deep breathing and coefficient of variability (CV) of R-R interval (variability of the heart frequency) and type of behaviour and every individual Bortner's item was examined with multiple regression analysis.

It shows that, within control group, there's statisticaly important total influence of all independent variables on to length of average R-R interval during deep breatring (multiple regression coefficient R=0,561, $p<0.05$). Statisticaly important influence on to multiple regression coefficient have items which asses »Tension« (beta=–0.508, $p<0.05$), »Expression of emotions« (beta=–0.314, $p<0.05$), total »Bortner« (beta=–0,200, $p<0.05$) and »Impetuosity« (beta=0.324, $p<0.05$) (Table 2).

Within the group of hypertonics influence of all independent variables on to coefficient of variability (CV) of R-R interval during calm breathing is statisticaly important (multiple regression coefficient R=0.509, $p<0.05$) (Table 3).

Profile index of eight basic emotions and it' s connection to heart frequency and it's variability

In the group of hypertonics, emotional dimensions like »Incorporation« and »Reproduction« showed relative intensity above average (more than 60%), while »Rejection« and »Destruction« were below average relative intensity (less then 40%). In the control group, emotional dimensions »Rejection« and »Destruction« were above, and »Rejection« and » Exploration« were below average. »Rejection« as an emotional dimension was statisticaly importainly lower in the group of hypertonics (t-test = –2.066, df = 99, $p<0.05$), while an emotional dimension »Exploration« in hypertonics was statisticaly importainly higher than in the control group (t-test = 2.986, df = 99, $p<0.05$). In between the group of hypertonics and the control group, there were no statisticaly important difference in relative intensity of other emotional dimensions.

A connection between an average R-R interval, during calm and during deep breathing, and coefficient of variability (CV) of the R-R interval (variability of the heart frequency) and Plutchik's eight basic emotions was tested with multiple regresion analysis.

In the control group, total influence of all independent variables on to coefficient of variability (CV) of the R-R interval (variability of the heart frequency) during

TABLE 3
A CONNECTION BETWEEN R-R INTERVAL AND COEFFICIENT OF VARIABILITY (CV) OF R-R- INTERVAL AND BORTNER'S TYPE OF BEHAVIOUR IN THE GROUP OF HYPERTONICS

Bortner scale (type of behaviour)	Beta coefficient of R-R interval		Beta coefficient of CV R-R interval	
	calm breathing	deep breathing	calm breathing	deep breathing
Punctuality	–0.04	–0.07	0.14	0.14
Competitive spirit	–0.04	–0.08	0.21	0.12
Disobedience	0.04	0.09	–0.20	0.18
Haste	0.40	0.41	0.18	–0.01
Impatience	–0.19	–0.16	0.18	0.06
Insecurity	–0.06	–0.05	–0.02	–0.12
Doing several things simultaneously	0.03	0.05	–0.06	–0.15
Impetuosity	–0.36	–0.37	0.05	0.14
Wish for acknowledgement	–0.11	–0.05	–0.34	–0.14
Promptitude	–0.04	–0.03	–0.26	–0.02
Tension	0.10	0.07	0.18	0.06
Expression of emotions	–0.10	–0.12	0.04	–0.25
Several interest	–0.16	–0.11	–0.19	–0.25
Ambition	–0.13	–0.10	–0.111	–0.14
TOTAL	–0.222	–0.143	–0.046	–0.033
Multiple regression coefficient	0.452	0.434	0.509	0.460

TABLE 4
A CONNECTION BETWEEN R-R INTERVAL AND COEFFICIENT OF VARIABILITY (CV) OF THE R-R INTREVAL AND EIGHT BASIC EMOTIONS IN THE CONTROL GROUP

Plutchik's eight basic emotions	Beta coefficient of R-R interval		Coefficient of variability (CV) of the R-R interval	
	calm breathing	deep breathing	calm breathing	deep breathing
Incorporation	–0.017	–0.317	1.575	0.900
Orientation	–0.086	–0.001	–0.322	–0.369
Protection	–0.110	–0.100	–0.821	–0.705
Deprivation	0.096	0.135	–0.608	–0.517
Rejection	–0.204	0.001	–0.802	–0.481
Exploration	0.043	–0.362	1.274	0.758
Destruction	0.047	–0.281	1.659	0.960
Reproduction	–0.071	0.100	–1.031	–0.563
Bias	–0.106	–0.140	–0.038	–0.015
Multiple regression coefficient	0.247	0.182	0.396	0.279

TABLE 5
A CONNECTION OF R-R INTERVAL AND COEFFICIENT OF VARIABILITY (CV) OF R-R INTERVAL WITH EIGHT BASIC EMOTIONS IN THE GROUP OF HYPERTONICS

Plutchik's eight basic emotions	Beta coefficient of R-R interval		Coefficient of variability (CV) of the R-R interval	
	calm breathing	deep breathing	calm breathing	deep breathing
Incorporation	–0.106	–0.220	0.069	1.198
Orientation	–0.143	–0.051	–0.327	–0.218
Protection	–0.066	–0.189	–0.513	–1.077
Deprivation	0.021	0.080	–0.644	–0.815
Rejection	–0.546	–0.712	–0.622	–1.096
Exploration	0.193	0.057	0.293	0.499
Destruction	0.605	0.379	0.519	0.601
Reproduction	0.138	–0.017	–0.523	–1.509
Bias	–0.080	–0.148	–0.147	0.150
Multiple regression coefficient	0.384	0.484	0.286	0.429

calm breathing (multiple regresion coefficient R=0.396, $p<0.05$) was statisticaly important, to which emotional dimensions »Incorporation« (beta=1.575, $p<0.05$), »Exploration« (beta=1.274, $p<0.05$) and »Destruction« had the most important positive contribution, while emotional dimensions »Protection« (beta =–0.821, $p<0.05$), and »Rejection« (beta =–0.802, $p<0.05$) and »Reproduction« (beta =–1,031, $p<0.05$) negatively contributed the most (Table 4).

In the group of hypertonics, statisticaly important was total influence of all independent variables on length of average R-R interval (multiple regresion coefficient R=0.484, $p<0.05$) and coefficient of variability (CV) of R-R interval (multiple regresion coefficient R=0.429, $p<0,05$) during deep breathing. CV of R-R interval was importainly positively connected to emotional dimension »Incorporation«(beta=1.198, $p<0.05$), and importainly negatively connected to emotional dimensions »Protection« (beta=–1.077, $p<0.05$), »Rejection«(beta=–1.096, $p<0.05$) and »Reproduction«(beta=–1.509, $p<0.05$) (Table 5).

Difference in anger level between the group of hypertonics and the control group was small and wasn't statisticaly important ($\chi^2 = 1.67$, df=2, $p>0.05$).

Discussion

In this study we studied autonomic regulation of the heart function, threw heart frequency and it's variability expressed by coefficient of variability in 100 sequential heart beats recorded by the EKG during calm and deep breathing, within 100 patients with essential hypertension and compared it to 100 healthy examinees in the control group. 75% of hipertonics had a positive family

history of hypertension, which coincides with literature data[55,56,57].

A body waight and a body mass index (BMI) were considerably higher in hypertonics then in the control group. According to dana from literature, there's positive correlation between increased body waight and hypertension.

Many epidemiologic studies of essential hypertension showed increased sympathetic activity, especially in the early phase of hypertension[63,64]. Heart frequency in hypertonics has positive connection with cardiovascular morbidity and mortality. With higher heart rate, cardiovascular morbidity and mortality increases[65–67]. Patients with essential hypertension, in our research, had considerably higher heart frequency at rest and during deep respiration than the control group. R-R variability at rest and during deep respiration was considerably lower in hypertonics than in the control group, which goes in favour of increased sympathetic activity, while vagal activity is reduced. A smaller increase in RR variability was found in hypertensive patients than in the control group during deep breathing.

A coefficient of variability calculated from standard deviation of the RR interval is useful clinical indicator of cardial parasympathetic activity[70,71]. A mechanism of decreased parasympatethic activity in the essential hypertension is connected with abnormal autonomic stimulation of normal sinal node or abnormal function of the beta-receptors. A beta-adrenergic hypersensitivity syndrome has been described[72].

A variability of heart frequency in hypertonics with left ventricle hypertrophy was significantly reduced considering the control group, which is already confirmed in some earlier studies[30,73,74]. A number of hypertonics with heart changes in our research was considerably lower than the number of those hypertonics without heart changes. Sistolic pressure, diastolic pressure, duration of hypertension, have total considerable influence on the heart frequency and it's variability. The most significant negative connection is found between variability of the heart frequency and duration of hypertension. Some recent studies showed that low variability of the heart frequency is a predictor of cardial events such as myocardial infarction, rapid progression of atherosclerosis and death after myocardial failure[75,76,77].

In hypertonics and in the control group »A« type behaviour was prevailing, but difference was not statisticaly important. That result could be explained with socioeconomic milieu and present period of »society in transition« in which we live today. Type A of behaviour is related to heart frequency and it' s variability. In the hypertensive group, total influence of all independent variables on variability of the heart frequency during calm breathing was statisticaly important. The heart frequency is considerably negatively influenced by items which assess »tension«, » expresion of emotions« and »total Bortner«, and positively by »impetuosity«. The type A behaviour is associated with increased heart frequency and it's variability in both groups.

An anger level was high within 65% of hypertonics. In the control group, 60% of examinees had high anger level, but difference was not statisticaly important. Some data from literature inform about connection between suppressed anger and high blood pressure. Haynes and associates and Goldberg didn't find constant connection between anger and blood pressure[80,81]. Anger can be result of psychosocial stress which is associated with hypertension or it's aggravation[82,83].

In »Emotion profile«, regarding the control group, hypertensive individuals had significantly lower emotional dimension »Rejecion«, and higher emotional dimension »Exploration«. These data says that hypertensive individuals are more uncritical and unable to relax than individuals in the control group. According to the literature avilable to us, Plutchik's »Emotion profile« was rarely used in hypertensive patients. Čatipović-Veselica and associates did not find significant difference in average emotion profile between hypertensive and normotensive workers[84].

Our data shows that patients with hypertension have increased heart frequency and reduced variability of the heart frequency. Increased heart frequency and reduced variability of the heart frequency in patients with long-term hypertension can contribute to progression of cardial morbidity and mortality. The question is whether to use medicaments or non-medicament methods to improve variability of the heart frequency.

1. The method of measuring hundred sequential heart beats on EKG, during rest and durind deep breathing, showed to be sensitive and simple diagnostic measure of decreased function of the parasympatethic nervous system in essential arterial hypertension. Coefficient of variability calculated from standard deviation of RR interval is useful clinical indicator of cardial parasympatethic activity in essential hypertension.

2. Patients with essential arterial hypertension had significantly higher heart frequency at rest and during deep breathing then the control group. Variability of the heart frequency, at rest and during deep breathing, was considerably lower in hypertensive patients then in the control group, which goes in favour of increased sympatethic activity, and reduced vagal activity.

3. A body mass and a body mass index (BMI) were considerably higher in examinees with essential arterial hypertension. Sistolic blood pressure, diastolic blood pressure, duration of the hypertension, have significant total influence on the heart frequency and it's variability. Variability of the heart frequency is negatively associated with duration of hypertension

4. Within examinees and controles prevailed »A« type behaviour. Items which assess »tension«, »expression of emotions« and »total Bortner« had negative considerable influence on the heart frequency but »Impetuosity« had positive influence.

5. Eight basic emotions according to Plutchik influence the heart frequency and it's variability. Hyperten-

sive patients were more uncritical and more unable to relax then the control group.

6. Our results show that patients with hypertension have increased heart frequency and reduced variability of the heart frequency, which are well known risk factors for increased cardial morbidity and mortality. This raises the quastion of therapeutic approach to the patient with essential hypertension, medicamentous treatment or some other methods like psychosocial to increase variability of the heart frequency.

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K. Kožul

Institute of Public Health for the Osijek-Baranja County, F. Krežme 1, 31000 Osijek, Croatia
e-mail: karlo.kozul@os.htnet.hr

FREKVENCIJA SRCA I NJENA VARIJABILNOST KOD BOLESNIKA S HIPERTENZIJOM

S A Ž E T A K

U ovom radu istraživali smo autonomnu regulaciju rada srca putem frekvencije srca i njene varijabilnosti kod 100 bolesnika s esencijalnom hipertenzijom i usporedili sa 100 ispitanika zdrave kontrolne grupe. Bolesnici s esencijalnom hipertenzijom imali su značajno kraći prosječni RR interval, odnosno bržu frekvenciju srca nego kontrolna grupa. Prosječna varijabilnost frekvencije srca je statistički značajno niža u hipertenzivnoj, nego u zdravoj kontrolnoj grupi. Na frekvenciju srca i njenu varijabilnost ukupno značajno utječu, pri mirnom i dubokom disanju: sistolički tlak, dijastolički tlak, masa lijevog ventrikula, dijastolička disfunkcija lijevog ventrikula, veličina lijevog atrija, trajanje hipertenzije, visina kolesterola i triglicerida. Najznačajnija negativna povezanost nađena je između varijabilnosti frekvencije srca i trajanja hipertenzije. U hipertenzivnih bolesnika i u kontrolnoj skupini češći je »A tip« nego »B tip« ponašanja. U hipertenzivnoj grupi statistički je značajan ukupan utjecaj svih nezavisnih varijabli po Bortneru na varijabilnost frekvencije srca pri mirnom disanju. Frekvencija srca i njena varijabilnost povezane su sa osam temeljnih emocija kodu hipertenzivnih ispitanika i kontrolne skupine. U grupi hipertenzivnih bolesnika varijabilnost frekvencije srca značajno je pozitivno povezana s emocionalnom dimenzijom »Inkorporacija«, a negativno s emocionalnim dimenzijama »Zaštita«, »Odbacivanje« i »Reprodukcija«. Naši podaci pokazuju da bolesnici s dugotrajnom hipertenzijom imaju povišenu frekvenciju srca i reduciranu varijabilnost frekvencije srca, što su poznati čimbenici rizika za povišeni kardijalni mortalitet.