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AUTONOMIC NERVOUS SYSTEM FUNCTION ASSESSED BY ANALYSIS OF HEART RATE VARIABILITY AT REST AND DURING EXERCISE IN HYPERTENSIVE AND NORMOTENSIVE SUBJECTS

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The aim of our study was to examine cardiovascular autonomic regulation, assessed by time and frequency domain measures of Heart Rate Variability (HRV), at baseline and during exercise test, in a group of mild to moderate hypertensive subjects, compared to normotensives.

We examined 14 patients (13 men, 1 woman) with mean age 49.3 ± 5.4 years and 14 normotensives (11 men, 3 women) with mean age 48 ± 7.1 years. All hypertensive patients had to stop their therapy 3 days before the test. An echocardiographic exam was performed on each subject before the beginning of the exercise test and we could notice significant differences in left ventricular SIV and posterior wall thickness, as well as in left atrium dimension and early and late ventricular filling ratio. All subjects underwent a bicycle exercise test, with a load increase of 25 Watt every 2 minutes, until exhaustion or until they reached 85% of their predictable heart rate. We measured the R-R intervals for a period of 10 minutes before the beginning of exercise and for a period of 3 minutes when patients reached 70% of the predictable heart rate. No significant difference was found between the two groups concerning maximum heart rate and maximum systolic blood pressure reached, while we observed significant differences in baseline heart rate (+11.4% in the hypertensive group), maximum diastolic blood pressure at the end of exercise and total duration of exercise (−12.3% in the hypertensive group). Finally, the analysis of the spectral components of HR variability showed a significantly higher ratio of LF/HF components in hypertensive patients compared to normotensives, both at baseline and during exercise.

It seems, therefore, possible to assume that increased sympathetic activity at baseline and unbalanced autonomic response to stimulation, such as physical exercise, might play an important role not only in the early stage of borderline hypertension, but also in patients with long-term hypertension, already showing signs of left ventricular hypertrophy.

Key Words: Autonomic Nervous System Activity, Heart Rate Variability, Pressure Response To Exercise

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DOPAMINERGIC DILATATION ON CHOLINERGIC AND ELECTRIC INDUCED CONTRACTIONS OF RAT ISOLATED TRACHEAL MUSCLE

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We have previously demonstrated in humans that inhaled dopamine (0.5–1 μg/ml/min) induces bronchodilatation in subjects suffering acute asthma attack, but did not modify the resting bronchial tone in normal subjects or in asthmatics without acute bronchospasm. Dopamine is likely to exert its inhibitory action on bronchial muscle by stimulating adrenergic or dopaminergic receptors. The present work examined the possible direct effect of dopamine on the airways smooth muscle of Sprague-Dawley rats. Tracheal rings were excised and placed in an organ bath containing Ringer’s solution at 37°C gassed with oxygen (95%) and carbon dioxide (5%). Contractile responses were recorded with an isometric transducer in a polygraph (Letical, Spain). Contraction was induced by electric field stimulation or pharmacologically by adding acetylcholine, into the bath. Dopamine cumulative dose/response/courses were obtained. Dopamine inhibited both electrical and cholinergic induced tracheal contractions. Dopaminergic dilatation was not blocked by propranolol (0.1 μM) or terazosin (10 μM) administration 30 minutes before contractions were elicited. Phenylopine (0.10 μM) did not reverse terazosin blocking action. These results suggest that dopamine inhibition is mediated by dopaminergic receptors rather than by β2 or α1 adrenergic receptor activation.

Key Words: Smooth Muscle Dopaminergic Receptors, Dopaminergic Regulation of Bronchi, Bronchial Tone

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DIVERGENT RELATIONSHIP OF BODY MASS INDEX WITH PLASMA NOREPINEPHRINE AND EPINEPHRINE

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Background: The correlation between the sympathetic-adrenal system and body weight is complex. Obesity is positively correlated with norepinephrine but the data concerning epinephrine is scarce. The aim of the present study was to characterize these relations in normotensive adult population.

Methods: One hundred and eleven healthy subjects reported to our laboratory for measurements of plasma catecholamines. Supine blood pressure, heart rate (HR), body weight and height were measured. Blood samples for epinephrine (EPI), norepinephrine (NE), deconjugated metanephrines (MN) and normetanephrines (NMN) were assayed by high performance liquid chromatography. Multivariate regression analysis was performed to examine relationships between body mass index (BMI), catechols and their metabolites in a model adjusted for age and gender, SBP, DBP and HR.

Results: Forty-three men and 68 women were evaluated (mean age 44.6 ± 14.6 years). Blood pressure averaged 125 ± 23/72 ± 12 mmHg, HR was 64 ± 11 bpm, and BMI was 27.3 ± 7.2. Plasma EPI was 27 ± 26 pg/ml, NE was 284 ± 167 pg/ml, MN – 1014 ± 454 pg/ml and NMN – 2382 ± 1323 pg/ml. As expected, BP, BMI and age were strongly correlated. The BMI was positively correlated with NE and NMN (0.03 and 0.22 respectively, p < 0.05). In contrast, BMI was negatively correlated with EPI and MN (−0.22 and −0.23 respectively, p < 0.05).

Conclusion: Increased body mass index is associated with divergent increases in sympathetic nerve activity and decreases in adrenal-medullary secretion of epinephrine. Sympathetic activation is implicated to contribute to obesity-related hypertension, whereas decreased epinephrine release may participate in the changes in fatty acid metabolism and energy metabolism that accompany and contribute to weight gain.

Key Words: Obesity, Catecholamines, Metanephrines