Ambulatory Blood Pressure Monitoring and Casual Blood Pressure in Hyper-Reactive Individuals

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Summary

Background: **Developing hypertension is likely to be at least two times greater in individual with exaggerated blood pressure response on exercise testing (ET). Few reports have evaluated the parameters of 24-hour Ambulatory Blood Pressure Monitoring (ABPM) in normotensive individuals with exaggerated blood pressure response to exercise.**

Objective: **To evaluate the relationship among the casual blood pressure with hyper-reactive response on ET and to compare Ambulatory Blood Pressure Monitoring (ABPM) data of hyper-reactive individuals with a control group in order to detect early disorders, that allows a preventive action with prognostic implication.**

Methods: **Casual BP measurement and parameters of ABPM of 26 adult individuals, with mean age of 41,50±11,78 years, normotensive at rest and hyper-reactive on ET was compared to those of 16 adult individuals, with mean age of 41,38±11,55 years, normotensive at rest with normal BP response on exercise. The values <140x90mmHg were considered normal for casual BP. The values <220mmHg for systolic BP and/or an increase ≥15mmHg diastolic BP on ET for hyper-reactive response diagnosis.**

Results: **Hyper-reactive individuals presented the systolic (p=0,03) and diastolic (p=0,002) casual BP and mean systolic BP (p=0,050), systolic pressure load during the day (p=0,011), and systolic (p=0,017) pressure load higher when compared to the control group.**

Conclusion: **Casual high normal BP had a positive correlation with exaggerated BP response. The hyper-reactive individuals showed particular characteristics in casual BP as well as in ABPM parameters, which, although within the range of reference values, differed from those of individuals with normal response to exercise.**

Key words: **Ambulatory blood pressure monitoring; exercise test; hyper-reactive response, hypertension.**

Introduction

There is a positive and continuous correlation between blood pressure (BP) and cardiovascular risk and mortality[1]. Systemic arterial hypertension (SAH), despite highly prevalent, is still underdiagnosed, even in developed countries.

In clinical practice, the diagnosis of SAH is achieved by an indirect method and the auscultation technique. The presence of the observer and the technique used can influence the measurement results[2]. The values obtained in the office are usually higher than those obtained at home and do not express the 24-BP oscillations[2].

The ergometric stress test (EST) promotes the early identification of individuals with an exaggerated response of BP to exercise. The hyper-reactive response (HRR) of BP to exercise constitutes a marked increase of systolic and/or diastolic BP to exercise in individuals with normal BP at rest[3]. It comprehends a physiopathological characteristic of the pre-clinical stage of established SAH, being more common in individuals with high-normal BP[4]. It is related with an at least 2-fold higher chance of developing future sustained SAH, in comparison to normotensive individuals who are not hyper-reactive to exercise[3]. BP at exercise presents a correlation with cardiovascular events and mortality[5]. The HRR has been correlated with target-organ injuries. Physical conditioning and control of modifiable risk factors for cardiovascular disease can influence the development of sustained SAH and these complications in such individuals.

The Ambulatory Blood Pressure Monitoring (ABPM) excludes the observer's influence and evaluates the behavior of BP during sleep and during the periods of physical and mental stress, when these individuals present an exaggerated increase in BP. These particularities confer ABPM a closer association with target-organ injuries than casual measurements do[6].

This was a prospective study that aimed at evaluating the association of casual BP measurement with exercise-related HRR and comparing the patterns of ABPM of normotensive

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individuals at rest, with and without HRR to exercise, in an attempt to detect early alterations in possible future hypertensive individuals, which will allow preventive measures with prognostic implications to be taken.

Methods

The study was carried out in private Health Services in the city of Teresopolis, Rio de Janeiro, Brazil. The volunteers included in the study were seen at these Services or referred by physicians from the Public Health System. All the volunteers signed an Informed Consent Form approved on November 21 2001, by the Research Ethical Committee of the Post-Graduation Course in Cardiology of the *Universidade Federal Fluminense* (UFF) / *Hospital Universitário Antonio Pedro* (HUAP), process # 87/01.

Of the 44 individuals referred to the study, 42 met the inclusion and exclusion criteria, as follows:

Inclusion criteria - Age range between 18 and 65, clinical diagnosis of "normotension" at rest, diagnosis of arterial hypertension reactive to EST for the study group and absence of arterial hypertension reactive to EST for the control group.

Exclusion criteria - Cardiovascular or systemic diseases, use of cardiovascular or neurological action drugs, diabetes mellitus, pregnancy, smokers, alcohol consumption and structural cardiopathy identified at the echocardiogram, except the hypertensive type.

The 42 individuals selected for the study were White Caucasian, aged between 18 and 63 years and were divided into 2 groups based on the casual measurement of BP and the response of BP to the EST (Chart 1).

The study group, called HYPER-REACTIVE (HR), consisted of 26 normotensive individuals at rest, with systolic and/or diastolic hyper-reactivity at the EST. The control group, called NORMORREACTIVE (NR), consisted of 16 normotensive individuals at rest, with a normal BP response to exercise.

The BP measurement at the office was carried out with the individual sitting, using an adequately calibrated sphygmomanometer and an appropriate cuff. BP was measured in both upper limbs, considering the highest value obtained. Three or more measurements were obtained in at least two distinct visits to the doctor's office, respecting the consensus recommendations. The means obtained from the two or more visits were regarded as the systolic and diastolic BP at the office. Normotension was considered when BP values were < 140x90mmHg, according to the criteria established by the III Brazilian Consensus of Arterial Hypertension[4].

The diagnosis of hyper-reactivity to exercise was established by the EST performed on a treadmill, according to the II Directives on EST[1]. The criteria used were systolic arterial pressure (SAP) > 220mmHg and/or an increase ≥ 15mmHg of diastolic arterial pressure (DAP), starting from normal basal BP levels. Individuals were considered to be normorreactive (NR) when SAP and DAP values were below those used for hyper-reactivity during the EST, also starting from normal basal BP levels.

The study started in February 2002 and was concluded in November 2003. All of the volunteers were submitted to an anamnesis and detailed physical evaluation and underwent a 12-derivation electrocardiogram at rest, EST and ABPM. The data obtained were written down in the patients' data collection files and stored in Microsoft© Excel spreadsheets for later analysis.

After the protocol had been followed by all the volunteers, the groups were statistically compared regarding the anthropometric data, family history of arterial hypertension and the echocardiogram, EST and ABPM parameters.

The anamnesis was directed in order to identify risk factors for cardiovascular disease, target-organ injuries, possible co-existing illnesses, first-degree family members with a history of arterial hypertension and use of medication.

The echocardiograms were carried out in a GE LOGIC 500 or ESAOTE AU3 equipment. The left ventricle diameters, size of the left atrium (LA) and aorta (AO) as well as the thickness of the interventricular septum in diastole (IVSd) and the left ventricle posterior wall in diastole (LVPWd) were measured. The calculation of the LV measurements was based on the Teichholz formula. Ventricular mass was calculated through the modified formula by the American Society of

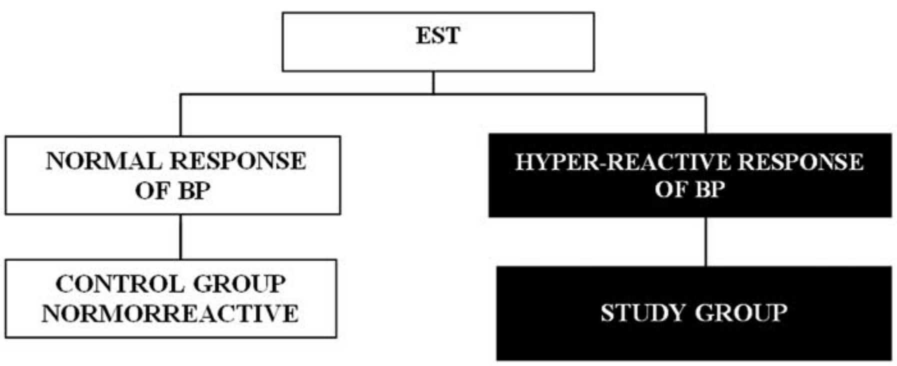

Chart 1 - *Group division. EST - ergometric stress test.*

Echocardiography and the left ventricular mass index (LVMI) cutoff value was 125g/m^2.

The EST was performed in an ECAFIX – EG 700 treadmill by 37 individuals, whereas 4 individuals used an INBRAMED treadmill, model KT 2000 and one used an APEX 200 treadmill. All of the volunteers were submitted to the Bruce protocol, except for one participant who was submitted to the Ellestad protocol. The parameters evaluated in the period immediately before the EST, during the exercise and at 2, 4 and 6 minutes of recovery were heart rate (HR), SAP, DAP and pulse pressure (PP), and the double product (DP).

The ABPM was carried out in a Cardio Systems equipment with the DYNAMAPA program, with an adequate cuff for the individual's arm and following the consensus recommendations[7]. The mean interval between the EST and ABPM was 67 days. All the individuals were submitted to the ABPM on a routine activity day. The protocol used was the same for all participants and included measurements every 15 minutes during wakefulness and every 20 minutes during sleep.

The BP loads, BP means and systolic and diastolic descents were measured during sleep. The values considered normal for ABPM were the following:

- BP during wakefulness < 135 x 85mmHg;
- BP during sleep < 120 x 75mmHg;
- BP loads < 30%;
- 24-h systolic pressure mean < 130mmHg;
- 24-h diastolic pressure mean < 80mmHg;
- Systolic and diastolic descent during sleep between 10% and 20%.

All ABPM measurements were submitted to the evaluation of two different observers.

Statistical analysis was carried out by Student's *t* test for independent samples, in the comparison of quantitative data between the HR and NR groups or by the non-parametric Mann-Whitney test, when the variable presented a Gaussian distribution. When the variance between the two groups, when evaluated by the Bartlett test, was not similar, Student's *t* test was used for non-homogenous samples. To compare the proportions of qualitative data, the Chi-square test was used (ε^2) or Fischer exact test, when the first was not feasible. Statistical significance was set at 5%. The statistical analysis was carried out by the SAS© System statistical software.

Results

Anthropometric variables - The HR and NR groups were comparable regarding the anthropometric variables with the following respective means for age: 41.50 ± 11.78 and 41.38 ± 11.55 years (p=0.97); weight: 76.16 ± 15.55 and 68.69 ± 12.49 kg (p=0.11); height: 1.68 ± 0.10 and 1.66 ± 0.11 m (p=0.54) and BMI: 26.80 ± 3.81 and 24.94 ± 4.05 kg/m^2 (p=0.14) (Table 1).

Family history of arterial hypertension - The groups did not differ significantly regarding the presence of family history of arterial hypertension (73.08% in the HR group and 53.33% in the NR group, with p=0.19).

Office clinical variables - Regarding the basal clinical variables, the HR group presented SAP (120.68 ± 10.70 mmHg) and DAP (80.44 ± 5.58 mmHg) means at the office that were significantly higher when compared to the NR group (SAP = 113.52 ± 9.54 mmHg and DAP = 74.63 ± 6.06 mmHg) with p= 0.03 and 0.002, respectively. PP (40.24 ± 7.80 mmHg in the HR group and 38.90 ± 6.99 mmHg in the NR group) and HR (77.27 ± 11.00 mmHg in the HR group and 74.75 ± 9.77 mmHg in the NR group) were similar in both groups (p = 0.57 and 0.45, respectively - Table 2).

Echocardiogram variables - Regarding the variables at the transthoracic echocardiogram, the HR and NR groups were comparable, except for the absolute values of the AO diameter (3.12 ± 0.34 cm *vs* 2.92 ± 0.24 cm, respectively) which, although were within the parameters of normality, were significantly higher in the HR group (p=0.044) and the size of the LA (3.38 ± 0,30 cm and 3.19 ± 0.42 cm, respectively), which was also higher in the HR group, although without reaching statistical significance (p= 0.08). When corrected for the body surface area, the values of the AO (1.69 ± 0.16 cm/m^2 in HR and 1.67 ± 0.17 cm/m^2 in the NR group) and of the LA (1.84 ± 0.19 cm/m^2 in the HR and 1.82 ± 0.22 cm/m^2 in the NR group) did not differ between the groups (p= 0.73 and 0.79, respectively). The groups had similar LV mass (134.39 ± 37.42 g in the HR and 128.56 ± 30.71 g in the NR group) and LVMI (71.78 ± 14.88 g/m^2 in the HR and 73.02 ± 16.10 g/m^2 in the NR group) and there were no signs of ventricular remodeling or hypertrophy in any of the patients enrolled in the study.

Table 1 - Anthropometric characteristics

Variable	Group	Mean ± SD	(p)Value
Age (yrs)	HR NR	41.50 ± 11.78 41.38 ± 11.55	0.97
Weight (kg)	HR NR	76.16 ± 15.55 68.69 ± 12.49	0.11
Height (meters)	HR NR	1.68 ± 0.10 1.66 ± 0.11	0.54
BMI (kg/m^2)	HR NR	26.80 ± 3.81 24.94 ± 4.05	0.14

HR - hyper-reactive; NR - normorreactive; BMI - body mass index.

Table 2 - Office variables

Variable	Group	Mean ± SD	(p)Value
Casual systolic BP (mmHg)	HR NR	120.68 ± 10.70 113.52 ± 9.54	0.03
Casual diastolic BP (mmHg)	HR NR	80.44 ± 5.58 74.63 ± 6.06	0.002
Pulse pressure (mmHg)	HR NR	40.24 ± 7.80 38.90 ± 6.99	0.57
Heart rate (bpm)	HR NR	77.27 ± 11.00 74.75 ± 9.77	0.45

HR - hyper-reactive; NR - normorreactive; BP - blood pressure.

EST variables - Regarding the pre-EST variables in the HR and NR groups, the SAP (122.92 ± 11.79 mmHg and 119.13 ± 8.58 mmHg), DAP (76.69 ± 6.79 mmHg and 77.38 ± 6.80 mmHg), the HR (83.19 ± 13.96 bpm and 79.19 ± 8,46 bpm) and the DP (10172 ± 1663 and 9422 ± 1121) were comparable (p=0.27 / p=0.75 / p=0.25 and p=0.11, respectively), whereas PP was significantly higher in the HR group (46.23 ± 7.88 mmHg and 41.75 ± 4,12 mmHg, with p= 0.02).

During the intra-stress period, the amount of metabolic equivalents (METS) attained was similar (11.06 ± 3.28 in the HR and 11.01 ± 2.35 in the NR group; p=0.95), indicating that both groups were submitted to the same level of stress. The DP (32431 ± 5208 and 25999 ± 4427 with p=0.0002), SAP (193.08 ± 27.68 mmHg and 153.00 ± 18.33 mmHg with p<0.0001), DAP (103.77 ± 11.92 mmHg and 85.75 ± 7.00 mmHg with p=0.0001) and the PP (90.08 ± 20.12 mmHg and 67.25 ± 17.07 mmHg with p=0.0005), obtained at the stress peak were significantly higher in the HR group, as well as during the recovery period (highest p=0.002). HR (113.74 ± 12.10 bpm and 109.80 ± 9.56 bpm) did not differ between the (p=0.29), as shown in Figures 1 and 2.

Ambulatory blood pressure monitoring variables - The ABPM variables that showed to be significantly higher in

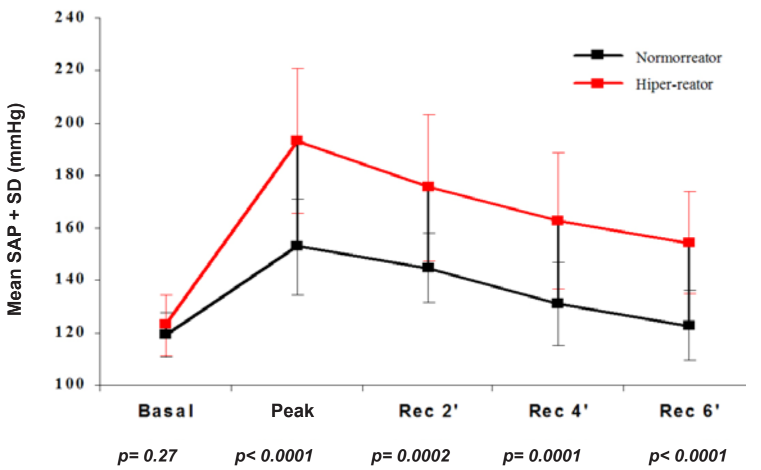

Fig. 1 - *Systolic blood pressure at the ergometric test. SAP - systolic arterial pressure; SD - standard deviation; Rec 2' - 2 minutes of recovery; Rec 4' - 4 minutes of recovery; Rec 6' - 6 minutes of recovery.*

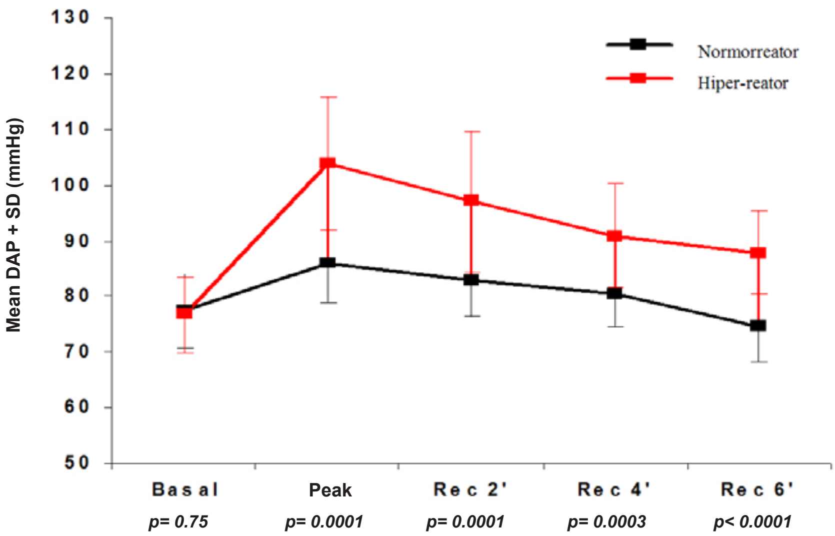

Fig. 2 - *Diastolic arterial pressure at the ergometric test. DAP - diastolic arterial pressure; SD - standard deviation; Rec 2' - 2 minutes of recovery; Rec 4' - 4 minutes of recovery; Rec 6' - 6 minutes of recovery.*

the HR group were mean SAP (116.92 ± 7.64 mmHg and 112.44 ± 5.75 mmHg with p= 0.050) and the systolic pressure load (SPL) during wakefulness (14.58 ± 13.22% and 4.44 ± 5.77% with p= 0.011) and the SPL in 24 h (12.46 ± 12.11% and 3.88 ± 4.16% with p= 0.017). The diastolic pressure load (DPL) during sleep (11.54 ± 15.87% and 4.25 ± 7.13% with p=0.077)) and the DPL in 24 h (21.96 ± 18.54% and 11.63 ± 12.73% with p= 0.061) of the HR group were also higher than those of the NR group, although without statistical significance (p=0.061 and 0.077, respectively) (Tables 3 and 4).

Discussion

The HRR, a physiopathological characteristic of the pre-clinical stage of SAH, has been associated with the development of target-organ injuries and a higher prevalence of future sustained SAH[3-6]. The adjuvant pharmacological treatment of HR individuals is not a consensus[8], but physical fitness and the control of modifiable risk factors for cardiovascular disease can influence the development of SAH and these complications.

The ABPM allows the assessment of BP at rest and during periods of physical and mental stress, when HR individuals usually demonstrate hyper-reactivity. It has a closer association with target-organ lesions than casual measurements[9] and can help in the therapeutic decision-making of these individuals.

Despite the statistical similarity between the groups regarding the anthropometrical variables, the HR group had more individuals whose BMI was above the reference values with 19.23% obese and 57.69% overweight individuals *vs* 12.5% obese and 25% overweight individuals in the NR group. It is worth mentioning that body weight control in the sample was not the aim of the study. The results obtained were predictable, considering the direct association between elevated BMI and increased BP, insulin resistance, diabetes mellitus, dyslipidemia, left ventricular mass (LVM) and morbimortality[10]. Currently, it is very clear that the control of risk factors for cardiovascular disease can modify the natural history of hypertensive or potentially hypertensive individuals. To invest in the weight control of HR individuals is mandatory, as it is one of the most effective measures and of the highest impact on the decrease of these complications.

Regarding the presence of family history of SAH, despite being more frequent in the HR group, no statistical significance was observed in relation to this parameter. This finding can be explained by the data collection attained through interviews made directly with the research subject and not by the direct evaluation of family members.

No significant alterations were observed in the clinical assessment of the studied population. The fundoscopic examination was normal except in one patient with hypothyroidism with significant HRR at stress that presented some arteriovenous crossing points, which are common findings to SAH and atherosclerosis. The presence of target-organ lesions in HR individuals is controversial in literature[11-13].

Table 3 - Ambulatory blood pressure monitoring variables

Variable	Group	Mean ± SD	Median	(p) value
SPL wakefulness (%) *	HR NR	14.58 ± 13.22 4.44 ± 5.77	11.5 2.0	0.011
DPL wakefulness (%) *	HR NR	26.19 ± 22.84 14.75 ± 17.81	25.0 7.0	0.10
SPL sleep (%) *	HR NR	8.35 ± 12.96 2.88 ± 3.95	3.5 3.0	0.25
DPL sleep (%) *	HR NR	11.54 ± 15.87 4.25 ± 7.13	5.0 0.0	0.077
SPL in 24 h (%) *	HR NR	12.46 ± 12.11 3.88 ± 4.16	9.0 2.5	0.017
DPL in 24 h (%) *	HR NR	21.96 ± 18.54 11.63 ± 12.73	20.5 7.5	0.061
Systolic descent (%)	HR NR	13.31 ± 4.96 13.63 ± 4.81	13.5 14.5	0.83
Diastolic descent (%)	HR NR	17,.77 ± 8.38 18.13 ± 7.93	17.5 18.5	0.89

*HR - hyper-reactive; NR - normorreactive; SPL - systolic pressure load; DPL - diastolic pressure load. * Non-parametric Mann-Whitney test.*

Table 4 - Other variables of ambulatory blood pressure monitoring

Variable	Group	Mean ± SD	(p) value
Systolic mean (mmHg)	HR NR	116.92 ± 7.64 112.44 ± 5.75	0.050
Diastolic mean (mmHg)	HR NR	74.31 ± 5.83 71.81 ± 4.90	0.16

HR - hyper-reactive; NR - normorreactive.

The SAP constitutes an important marker of cardiovascular morbimortality risk. Its reduction to 12 - 13 mmHg minimized the risk of coronary artery disease in 21%, of stroke in 37%, of terminal renal disease in 13% and total cardiovascular mortality in 25% after 4 years of follow-up, in an observational study[14]. The SAP and DAP means in the present study were significantly higher in the HR group, although they remained within the reference values. These findings corroborate those by some authors that observed a higher casual BP in these individuals, which was not influenced by gender or race, in comparison to NR individuals, even after five years of follow-up[15].

The echocardiogram showed that the absolute value of the aorta diameter was significantly higher in the HR group. The left atrium size was also larger in this group, although there was no statistical significance. These results yielded the hypothesis that there is an association between the aorta and the left atrium dilation and BP hyper-reactivity. The adjustment of these values for the body surface area, however, showed that the groups were comparable. The ventricular geometry and the systolic and diastolic function indexes were within the reference parameters and there was no sign of left ventricular remodeling or hypertrophy (LVH) in any of the study participants. These results support those by Cardillo[16] and by Herkenhoff[17] who did not find either geometric or functional alterations of the LV in these individuals, in the absence of significant BP increase at ABPM. Other authors, however, observed a significant and independent association between left ventricular mass and maximum BP at stress[11]. Such controversies observed in the echocardiographic correlations with HRR at stress[11-13] might be related to the method subjectivity, the cutoff values used to define SAH and HRR at stress and the sample variability, as well as to some co-variables such as age, body mass and BP at rest.

In the pre-stress phase of the EST, SAP, DAP, DP and HR were similar between the groups, whereas PP was significantly higher in the HR group. This result acquires significance as PP in all EST phases shows to be an important determinant of LVM[18]. Additionally, the study by Framingham[19] showed that the widening of PP was more effective than SAP and DAP in predicting coronary artery disease.

The BP in the anticipatory phase of the EST has been directly and positively associated with BP at the stress peak[18] and with a higher probability of future sustained SAH[4]. In agreement with these data, all individuals with borderline BP in the present study developed HRR at stress.

The BP at stress is more effective than the casual measurement in the identification of potentially hypertensive individuals[5,20] and is better correlated with cardiovascular morbimortality[5,20]. In this study, the values of SAP, DAP, DP and PP at stress peak were significantly higher in the HR group. These results were expected, considering the stratification of the groups from the BP values attained at this phase and they demonstrate a distinct and characteristic behavior of these individuals during stress, which has been ascribed to the autonomic dysfunction[4]. The HR at the stress peak did not differ between the groups, in agreement with the findings by Bendersky et al[21].

The HR individuals sustained values of SAP, DAP, PP and DP that were higher than those exhibited by the NR individuals during all of the recovery phase, with no significant difference regarding HR. These results corroborate findings in literature, which show that HR individuals present impaired vasodilation at physical exertion, caused by the endothelial dysfunction[4] that can extend to the recovery period and manifest in the early stages of SAH. In normotensive individuals, the delay in BP recovery immediately after the EST predicts SAH[4], whereas the slow return of the HR in the first minute post-exertion constitutes an independent death predictor[22]. The SAP elevations in the third minute of the recovery phase[13] and SAP and DAP elevations after four minutes of the recovery phase[20] are related to a higher risk of SAH. The SAP at the third minute of the recovery phase that is higher than peak BP has also shown to be an important predictor of coronary artery disease[3]. Considering all these data, the fundamental importance of the EST in the identification of individuals with a higher chance of developing SAH and cardiovascular complications is observed through the differentiated and more persistent responses of the HR individuals, also possibly observed in physical and mental stress moments.

Considering the parameters currently used as reference, the ABPM was not able to stratify the groups within and outside these limits, but it identified discriminating characteristics in HR individuals. The SAP mean as well as SPL in wakefulness and SPL in 24 hours were significantly higher in the HR group, although within the reference range, confirming the findings by Nazar et al[23], who observed an association between SAP at stress with the 24-hour mean and SAP during wakefulness. These results reinforce the hypothesis of a sympathetic hyper-reactivity in HR individuals[4], corroborated by the elevation of the diurnal parameters and their normality during sleep. Lima et al[24] observed BP values during the wakefulness period, during sleep and in 24 h, as well as mean BP in 24 h that were significantly higher in HR individuals.

The study by Marsaro et al[25] showed that the NR and HR individuals presented similar BP means at two subsequent monitoring episodes, whereas the systolic measurements during sleep and SPL in 24 h were significantly more elevated in the HR group.

Verdecchia et al. correlated the cardiovascular risk directly with SAP, DAP and PP to ABPM[26] and with the difference between BP at ABPM and casual BP[27].

The absence of pressure descent during sleep has been attributed to an autonomic nervous dysfunction and associated with cardiovascular risk[27] and with target-organ lesions, especially left ventricular mass[9], silent stroke[28] and microalbuminuria[29]. IN the present study, there was no significant difference between the groups regarding BP descent.

The participants of this study, although randomly referred by professionals from other services, were coincidentally all White Caucasians and had no evidence of other concomitant diseases, which limits the extrapolation of the results to other racial groups and patients with other associated comorbidities.

The ABPM is more effective than the casual BP measurement in the control of individuals with SAH and even influences treatment in 30-40% of the cases, showing the potential economic impact that this method can have on SAH treatment[30]. The broader use of the examination in clinical practice is recent. As this is a relatively new method, not all the criteria of normality have been well established. The standard deviation of the BP means, used to evaluate the variability of BP in ABPM, for instance, is considered inappropriate and there are still no criteria for its interpretation, despite the evidence of its association with target-organ lesions.

The linear association between BP increase and the cardiovascular risk, currently well-established, has led to the search for increasingly lower limits of normality for BP. Some criteria of ABPM normality have also been modified after the data collection phase of this study. Additional reductions in these parameters can be significant in the differentiation between HR and NR individuals.

The fact that SAH is still underdiagnosed seems to be caused by the lack of information on the part of the population, the difficulty in accessing healthcare services by a large part of the population and the insidious and asymptomatic course of the disease, which causes hypertensive individuals to forfeit medical attention. This great difficulty regarding the early diagnosis of these individuals can be extrapolated into treatment and treatment adherence. Thus, it becomes difficult to envision that patients that are HR at stress with normal BP at rest have a reasonable chance of being identified at the early stages, considering the primary care of Public Health. Some points have been well defined regarding these individuals and among them, their higher risk in developing future SAH and cardiovascular events. Therefore, this group deserves all efforts concerning an early identification, aiming at primary prevention with prognosis improvement. In order to do so, we must improve the currently available methods, aiming at increasing its sensitivity and availability. Considering how much the EST and ABPM can be of assistance in diagnosis, treatment and follow-up of hypertensive and potential future hypertensive individuals, it becomes clear the need for a broader access of higher risk patients to these methods. It is also necessary to make the population aware of the disease and promote political sensibilization to guarantee medical care.

In conclusion, the present study shows that HR individuals presented a SAP mean and SPL during wakefulness and in 24 hrs higher than those exhibited by NR individuals at ABPM. The more elevated BP levels had a positive correlation with the HRR at stress. The early identification of individuals with more elevated casual BP and, therefore, with a higher risk of developing HRR, can signalize the necessity to have a more directed investigation and approach of this population. This can also influence the decision of requesting higher-cost examinations such as EST and ABPM, with a preventive, diagnostic and therapeutic applicability.

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Potential Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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