The Effect of Siesta in Parameters of Cardiac Structure and in Interpretation of Ambulatory Arterial Blood Pressure Monitoring

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Objective *- To evaluate the influence of the siesta in ambulatory blood pressure (BP) monitoring and in cardiac structure parameters.*

Methods *- 1940 ambulatory arterial blood pressure monitoring tests were analyzed (Spacelabs 90207, 15/15 minutes from 7:00 to 22:00 hours and 20/20 minutes from 22:01 to 6.59hours) and 21% of the records indicated that the person had taken a siesta (263 woman, 52±14 years). The average duration of the siesta was 118±58 minutes.*

Results *- (average ± standard deviation) The average of systolic/diastolic pressures during wakefulness, including the napping period, was less than the average for the period not including the siesta (138±16/85±11 vs 139±16/86±11 mmHg, p<0.05); 2) pressure loads during wakefulness including the siesta, were less than those observed without the siesta); 3) the averages of nocturnal sleep blood pressures were similar to those of the siesta, 4) nocturnal sleep pressure drops were similar to those in the siesta including wakefulness with and without the siesta; 5) the averages of BP in men were higher (p<0.05) during wakefulness with and without the siesta, during the siesta and nocturnal sleep in relation to the average obtained in women; 6) patients with a reduction of 0- 5% during the siesta had thickening of the interventricular septum and a larger posterior wall than those with a reduction during the siesta >5%.*

Conclusion *- The siesta influenced the heart structure parameters and from a statistical point of view the average of systolic and diastolic pressures and the respective pressure loads of the wakeful period.*

Keywords: siesta, ambulatory arterial blood pressure monitoring, sleep

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Ambulatory arterial blood pressure (BP) monitoring is a test for evaluating arterial blood pressure over a 24 hours period while the patient carries out his or her routine activities, including sleeping. It is a useful test for the diagnosis of arterial hypertension, because it eliminates white coat hypertension and evaluates the efficiency of BP treatment during a 24 hours period [1]. This methodology, by intermittently evaluating arterial pressure, allows observation of the circadian variation in arterial pressure with higher levels during wakefulness and lower ones during sleep.

Reduction in arterial blood pressure levels during sleep occurs in most individuals, who are called dippers. Individuals who do not experience a reduction in arterial pressure during sleep are called nondippers. O'Brien et al.[2] in 1988 in a letter to the editor reported that he evaluated the reduction in arterial pressure during sleep with the use of arterial blood pressure monitoring and found that of 123 hypertensive patients 17.1% did not have a difference of at least 10/5mmHg between the average of systolic and diastolic pressures in the wakeful period and sleep. Pickering [3] stresses that in the majority of hypertensive patients the pattern of wakefulness and sleep is consistent with higher pressure values during wakefulness and lower ones during sleep. Staessen et al.[4] extended the study of pressure reduction during sleep by analyzing 7,320 hypertensive and normotensive subjects from an international database. Results showed that for all individuals the reduction of systolic/diastolic pressure during sleep was 16.7±11/13.6±8mmHg [4]. In addition, the reduction was greater in borderline and treated hypertensives than in normotesives, in men than women, in Europeans than in individuals from other continents and in readings made with an oscilometric apparatus than those made with an auscultatory apparatus. [17]. It was also observed that the reduction is smaller in elderly than in young people. An analysis [5] of the night/day relation, defined as the relation of night/day pressure multiplied by 100 expressing the nocturnal pressure as a percentage of diurnal pressure verified that 2.5% of normotensive, 4.4% of borderline hypertensives and 4.4% of treated hypertensives had a night/day relation equal to 100% for systolic and diastolic pressures, indicating the absence of pressure reduction during sleep for the two pressures [5].

Absence of arterial blood pressure drop during sleep correlates with lesions in organs, such as microalbuminuria, lacunary infarction and left ventricular hypertrophy [6-9]. The majority of studies that have analyzed the variations in arterial pressure between the wakeful period and sleep have classified sleep as the sleep that occurs at night. However, many people have the habit of resting during the day, or taking the so-called siesta, frequently observed among Latin people. It is estimated that half of the world's population still has this habit of taking a short rest, stopping work activities during the day, in spite of the changes brought on by the modern world [10].

As little is known about the effects of the siesta on the BP average and pressure load registered during arterial blood pressure monitoring, we decided to study this influence in the City of Maceió, State of Alagoas, where the siesta is habitual. Therefore, this study had as its objectives: a) identifying the prevalence of the siesta in a hypertensive population; b) evaluating the influence of the siesta on the average arterial blood pressure and pressure load during the wakeful period; c) correlating cardiac structure parameters with the reduction in arterial pressure during the siesta.

Methods

We analyzed 1940 arterial blood pressure monitoring examinations performed at the clinic in the city of Maceió, Alagoas. The monitoring was performed with an oscilometric type apparatus (Spacelab 90207) with measurements taken every 15 minutes throughout the day, from 7:00 to 22:00 hours and every 20 minutes during the night, from 22:00 to 6:59 hours. The test was performed on a day when the patient was to carry out his or her usual activities. The apparatus was placed on the nondominant arm, and the patients were instructed to keep the arm extended alongside their body and not move it while the measurement was being taken.

The monitoring apparatus was calibrated monthly against a mercury column sphygmomanometer. Only tests with at least 80% valid measurements and that did not have more than a two hours period (gap) of nonmeasurement were considered. The arterial pressure monitoring was made for either diagnostic confirmation of hypertension or for evaluation of drug therapy.

Two-dimensional echocardiography (Toshiba SSH-140 AE Color Doppler) was used to evaluate left ventricular mass, interventricular septal thickness, thickness of the posterior wall and the index of left ventricular mass. The left ventricular mass index was calculated by the Devereux formula normalized by body surface.

In data analysis, starting and finishing times registered in patient's diary were used for calculating the BP averages of wakeful periods, nocturnal sleep and the siesta. The following variables were analyzed: a) arterial pressure in the wakeful period with and without a siesta; b) arterial pressure during the siesta; c) arterial pressure during the night; and d) pressure load during wakefulness with and without a siesta. For calculation of the wakeful period, with and without a siesta, the inclusion and exclusion of the siesta period were analyzed, respectively.

The reduction in arterial pressure during a siesta or nocturnal sleep was calculated as the percent difference between arterial pressure during the wakeful period and the sleep period and classified in the following manner. a) ≤0%; b) 0,1 a 4,9%; c) 5 a 10%; d) ≥10%.

In statistical analysis, the profile analysis was used for the comparison of average arterial pressure and the nonparametric Wilcoxon test for pressure loads and the relation of arterial pressure reduction at night sleep and during the siesta with echocardiograph variables. The results were expressed as average ± standard deviation. The probability of $p<0.05$ was considered statistically significant.

Results

We analyzed 405 (21%) tests, 263 (65%) from women and 142 (35%) from men with a mean age 52±14 years who reported in their diary that they had taken a siesta on the examination day. The average length of the siestas was 118±58 minutes with eight measurements in this period.

The percentage distribution of the reduction in arterial pressure dip at different levels of the adopted criteria was very similar to that of the siesta and night sleep (fig.1). Regarding systolic pressure, 14% and 13% of the patients did not have a reduction in arterial pressure (≥0%) during the siesta and night sleep, respectively. For diastolic pressure, 11% and 7% of patients did not have an arterial pressure dip (≤0%) during the siesta a or the night sleep period, respectively.

The average of systolic and diastolic pressures during the wakeful period, including the siesta, was significantly

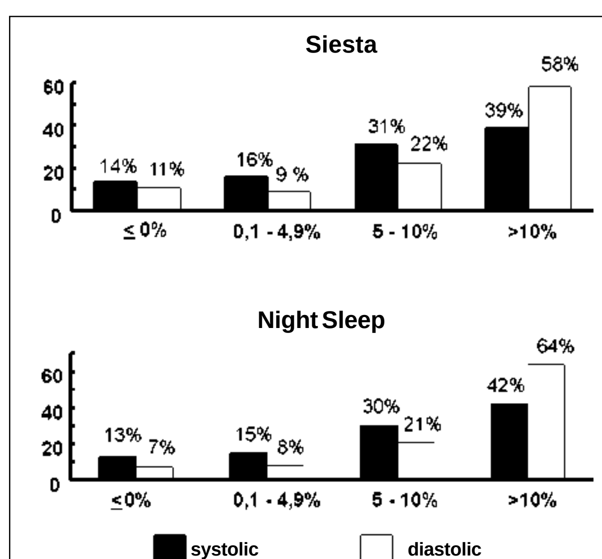

Fig.1 – Percentile distribution of systolic and diastolic pressure drop during siesta and night sleep according to the percentile difference between arterial pressure during wakeful period and sleep period (≤0%; 0,1 **to 4,9%; 5 to 10%; ≥10%).**

less than that of the wakeful period without the siesta138±-16/85±11 vs 139±16/86±11mmHg, p <0.05 fig.2). The systolic and diastolic pressure loads during the wakeful period, including a siesta, were also significantly less than those observed without the siesta (37±32/34±30 vs 40±34/37±-32%, p <0.05, fig.3). Consequently, the siesta from a statistical point of view interfered as much in the average of arterial pressure in the wakeful period as it did in the pressure loads.

The average of systolic and diastolic pressures in thee nocturnal sleep periods and during siesta (fig.2) were not different from each other, (127±17/75±12 vs 127±18/75±12mm-Hg). However, the average of arterial pressure during the siesta and night sleep was significantly less (p<0.05) when compared with the average of arterial pressure during the wakeful period, including or excluding the siesta. The reduction in systolic and diastolic arterial pressures in relation to the period of wakefulness with and without a siesta, in periods of night sleep (10.9±8.9/10.2±6.7 vs±10.9/11.2±7.5 mmHg) and of siesta (10.7±10.1/9.7±7.3 vs 11.7±11.3/10.7±7.6mmHg) were not different (Fig.4). However, in 45% of the tests, the average of systolic and diastolic pressures during the siesta were significantly less than that of the night sleep (121±14/71±11 vs 125±18/74±12mmHg, p<0.05). Consequently, in this group, the systolic and diastolic pressure dips in the siesta period were significantly greater (p<0.05) than the dips of during the nocturnal sleep when wakefulness with siesta (16±7/13±6 vs 11±10/10±7mmHg) and without siesta(17±10/14±6 vs 13±12/11±8mmHg) are considered.

The averages of arterial pressure were significantly higher (p<0.05) in male than in female patients in the different evaluations, based on the analysis of the period of wakefulness with a siesta (143±16/90±11 vs 135±15/82±10 mmHg), wakefulness without a siesta (143±17/91±11 vs 137/84±10 mmHg), the period of the siesta (131±19/80±13 vs 125±17/73±11 mmHg) and the period of nocturnal sleep (134±17/81±13 vs123±15/72±11 mmHg). An analysis of arterial pressure behavior revealed that in men and woman no difference exists in the averages of wakefulness with and without siesta. On the other hand, men have a greater dip during a siesta compared with that of the night sleep (fig.5).

In 77 patients cardiac structure parameters obtained by echocardiogram and the correlation with the fall of arterial pressure during the siesta and night sleep period were analyzed. For this analysis, the fall of arterial pressure du-

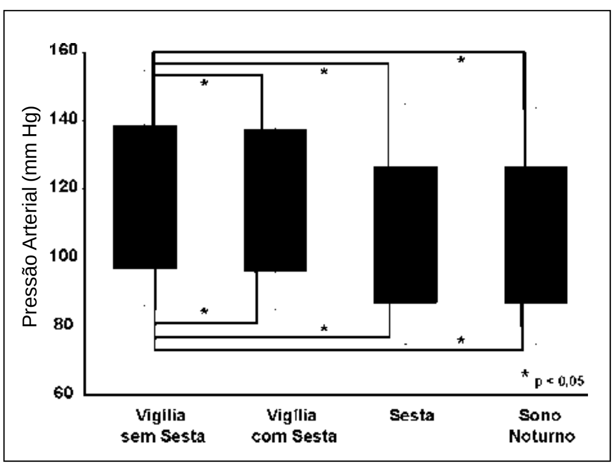

Fig.2 - Systolic and diastolic pressures (± sd) during the wakeful period with and without a siesta, during siesta and nocturnal sleep.

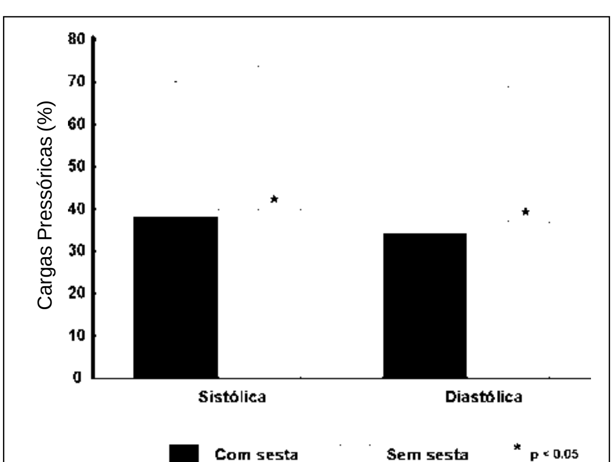

Fig.3 - Average (± sd) of systolic and diastolic pressure loads during the wakeful period with and without siesta.

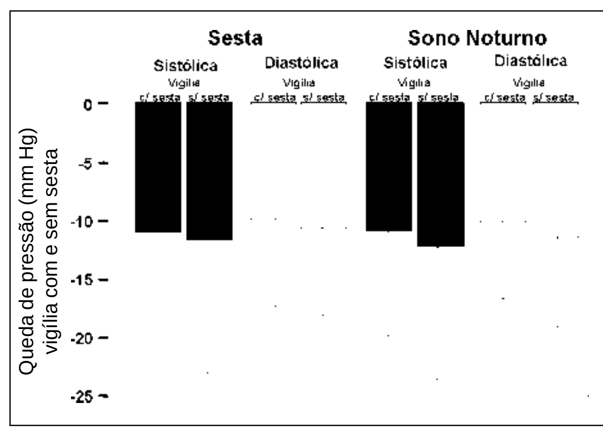

Fig. 4 - Average (± sd) of arterial pressure fall during siesta and nocturnal sleep in relation to the wakeful period with and without the siesta.

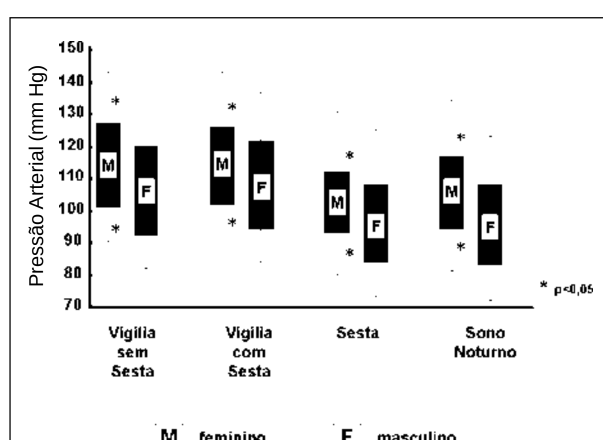

Fig. 5 - Influence of sex on the average (± sd) of pressure in the wakeful period without siesta, wakeful with siesta, siesta and nocturnal sleep. Sd- standard deviation.

ring sleep was stratified in percentages in the following ranges: <0% 0.1 to 4.9%, 5 to 10% and >10%. Results showed that: a) thickness of the interventricular septum in patients with a dip of in systolic and diastolic pressures during the siesta in the 0 to 5% range, was significantly greater ($p<0.05$) than in patients with a dip during a siesta greater than 5% (9.7/9.6 vs 8.5/8.8mm); b) thickness of the posterior wall in patients with a dip in systolic and diastolic pressures during the siesta in the range of 0 to 5% was significantly greater ($p<0.05$) than in patients with a dip during the siesta greater than 5% (9.4/9.5 vs 8.5/8.7mm); and c) no significant difference occurred in left ventricular mass (100.5/101.9 vs 86.7/89.9g) and the index of left ventricular mass (100.5/101.8 vs 87.2/90.3g/m ^{2}), with regard to the dip in systolic and diastolic pressures during a siesta in the 0 to 5% range in relation to the dip above 5%. No statistically significant correlation occurred ($p>0.05$) between the cardiac structure parameters and the dip in systolic and diastolic arterial pressure of night sleep in the different ranges analyzed.

Discussion

The siesta is a habit frequently observed in populations that have undergone arterial pressure monitoring. Bursztyn et al [11] and Pelosio et al [12] found a 35% prevalence in Israeli and Italian populations, respectively. However, Stergiou et al [13] reported a much higher prevalence (76%) of the siesta in a study carried out in Greece. In our study, 21% of the analyzed arterial pressures monitoring tests showed that siestas were taken, a lower prevalence compared with the above studies.

Results of our study reveal that sleep occurring during the day, i.e., the siesta, influenced, from a statistical point of view, the average of systolic and diastolic pressures and respective pressure loads of the wakeful period. However, this influence from a clinical point of view does not seem to be important in the majority of patients because it is only a difference of about 1mmHg. Because the difference is so slight, except in patients with borderline values of blood pressure according to the adopted criteria one may ignore this difference.

The fall in arterial pressure occurred in the two periods of sleep, diurnal and nocturnal, had the same magnitude, i.e., the siesta induced a decrease in arterial pressure such as that which occurred at night, although, almost half of the patients had a fall in arterial pressure during the siesta greater than that of the night sleep. Studies have demonstrated that the fall in arterial pressure during siestas and night sleep are similar. Bursztyn et al [11] studied 50 patients who took siestas, 16 normotensives, 10 untreated hypertensives and 24 treated hypertensives, and verified that the fall in arterial pressure in both periods of sleep, nocturnal and diurnal, were similar. Similar findings were reported in a study by Pelosio et al [12] who reported falls of 10 and 7mmHg during the siesta in relation to the wakeful period for the systolic and diastolic pressures, respectively. Stergiou et al. [13] also reported that the fall in arterial pressure during a siesta in relation to the period of wakefulness (8.7±7.8/13.9±10.5%) correlated positively with the dip during the period of night sleep ($r=0.38/0.36$) for the systolic and diastolic pressures, respectively ($p<0.0001$).

The fact that arterial blood pressure during the siesta is of the same magnitude as that of night sleep raises the question of whether the siesta should not be substituted in the evaluation of the existence or not of a drop in arterial pressure during sleep, reducing in this way, the time required for the examination. Chanudet et al. [14] evaluated whether the monitoring of arterial pressure could be done in shorter periods of time and concluded that during the daytime (10 to 22 hours) monitoring could be performed for 4 hours and the night monitoring (3-7hs) for 2 hours because these periods have a good correlation with the usual periods [14].

It is valid to question the importance of the influence of the siesta in the determination of BP averages and pressure loads during 24 hour monitoring of arterial pressure, as the values are small. In our study, the difference between the average arterial pressure of the wakeful period, eight hours and without a siesta, was only of 1mmHg. Statistically, this difference is significant in spite of the fact that in clinical practice 1mmHg usually does not influence the interpretation of arterial pressure monitoring data. However these doubts have less importance when analyzing a patient individually, because the benefits of reduction of a few millimeters in blood pressure averages can be of great value in reduction of morbidity and mortality caused by hypertensive disease [15].

Another result shown in our study the fact that men had a greater drop in arterial pressure during the siesta when compared with that of nocturnal sleep. Staessen et al [4] analyzing the nighttime fall (dip) in arterial pressure registered during arterial pressure monitoring, verified that men had a more accentuated night dip than women (16.7±0.2/12.3±0.2 vs 15.1±0.2/11.9±0.2 mmHg) [4]. Verdecchia et al [16] when analyzing the influence of sex, left ventricular hypertrophy and variations in arterial pressure in essential hypertensive patients, reported that a fall below 10% in systolic and diastolic pressures, comparing the night period in relation to daytime, increased the risk of left ventricular hypertrophy only in women. These data suggest that, compared with men, hypertensive woman require a longer exposure time to high BP levels during the 24 hours of the day to develop left ventricular hypertrophy. Along this same line, in a retrospective study of a control case led by the same author [17], a positive association between reduction or absence of a fall in arterial pressure during sleep and future morbid cardiovascular events were observed. Therefore, it is noted that the type of sleep, whether nocturnal or diurnal, influences the pressure fall during sleep, principally during siesta.

Usually, the dippers have been characterized by a fall of at least 10% in arterial pressure in sleep, in relation to the wakefulness based on the initial data by O'Brien et al, who observed a greater prevalence of cerebral vascular accident in patients with dips below 10%. Although no data exist correlating the percentage of BP drop during the siesta and cardiovascular events, as have been reported for the fall during sleep, a statistically significant difference has been verified in the measurement of the posterior wall and intraventricular septum on echocardiogram, when the 5% limit was used, suggesting that this level can be discriminatory in relation to the influence of the siesta in these cardiac parameters.

Several studies have demonstrated an increase in frequency and gravity of lesions in organs in hypertensive patients with an absence of reduction in arterial pressure during sleep [5,7,8,16]. Verdecchia et al [8] classified patients as nondippers, based on the absence of a night drop in arterial pressure of at least 10% and verified that in 55 nondipper patients, the index of left ventricular mass (93.3 g/m^2) was significantly greater than in 82 dipper patients (83.5g/m^2). Another study led by these same authors showed that in hypertensive patients who experienced a reduction in pressure during sleep, risk of cardiovascular morbidity was 1.79, but in patients without a reduction in pressure, the index rose to 4.99 [17]. As far as lack of a fall in blood pressure during the siesta is concerned, new studies must be developed to clarify these findings.

Therefore, the siesta, identified in 21% of the arterial pressure monitoring tests that we analyzed a) influenced, from a statistical point of view, the average of systolic and diastolic pressure and respective pressure loads of the wakeful period; b) determined the fall similar to that of night sleep; c) provoked greater arterial pressure fall in men compared with the night sleep fall; and d) influenced cardiac structure parameters. It is important to emphasize that, in spite of the siesta having influenced, from the statistical point of view, the average of systolic and diastolic pressures and the respective pressure loads of the wakeful period, this influence, from a clinical point of view, does not seem important, in the majority of patients, as it refers to a difference of 1mmHg. As such, except in patients with borderline values of the adopted criteria, one can ignore this difference.

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