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THE EFFECT OF DIFFERENT BODY POSITIONS ON BLOOD PRESSURE

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ABSTRACT

Aim: The aim of the present study was to test the effects of different body positions on BP readings in healthy young adults. **Background:** It is known that many factors influence an individual's blood pressuremeasurement. However, guidelines for accurately measuring blood pressure inconsistentlyspecify that patient's position and they should keep feet flat on the floor.Although there are more information on arm position in blood pressure measurement,surprisingly little information can be found in the literature with respect to the influenceof body position on the blood pressure readings in healthy young people. **Methods:** A total of 157 healthy young adults who had accepted to participate in thestudy were randomly selected. In all subjects the blood pressure was measured subsequentlyin four positions: Sitting blood pressure was taken from the left arm, whichwas flexed at the elbow and supported at the heart level on the chair. After at least oneminute of standing, the blood pressure was then taken standing, with the arm supportedat the elbow and the cuff at the heart level. After one minute of rest, the bloodpressure was subsequently taken supine position. Finally, after one minute the bloodpressure was again taken in this last position with supine position with crossed legs. **Results:** The blood pressure tended to drop in the standing position compared with the sitting, supine and supine with crossed legs. Systolic and diastolic blood pressure was the highest in supine position when compared the other positions. There was adifference between systolic blood pressures and this was statistically significant ($P < 0.001$) but the difference between diastolic blood pressure was not statistically significant ($P > 0.05$). All changes in systolic blood pressure were statistically significant except those from supine to supine position with crossed legs.

INTRODUCTION

Blood pressure (BP) measurement is perhaps the most frequently performed clinical procedure and important therapeutic decisions rely on its accuracy. However, its accuracy strongly depends both on the number of measurements and the circumstances during the procedure.[1] Unfortunately, it is perhaps one of the most inaccurately performed procedures done by healthcare providers. A study revealed that up to 97% of doctors do not adhere to the recommendations of the American Heart Association when measuring BP, yet crucial decisions about treatment are made based on these inaccurate measurements. Efforts have continuously been made to standardize the procedure, but it remains difficult to reach a consensus among different official guidelines for BP measurement.[2] Moreover, in daily practice and even in research, factors that can significantly influence BP measurements are sometimes erroneously neglected. One of these factors is the position of the both the patient and the arm during the BP measurement. The World Health Organization/International Society of Hypertension (WHO/ISH) guidelines on BP measurement recommend that BP should be measured routinely with the patient seated with the arms supported at the heart level, but the patient may also be supine or standing provided that the arm is supported at heart level for all body postures.[3] Other guidelines suggest that sitting and supine BP readings may be considered equivalent. In addition, the approximation of the heart level or the reference right atrium level is often vaguely mentioned or not mentioned at all. WHO/ISH and the British Hypertension Society (BHS) are more precise in their recommendations.[4] According to WHO/ISH, the right atrial level can be practically estimated at the level of the fourth intercostals space and according to BHS at the level of the mid-sternum. Although there is more information on arm position in BP measurement, little information can be found in the literature with respect to the influence of body positions on the BP readings in healthy young people.[5] The aim of the present study was to test the effects of different body positions on BP readings in Turkish healthy young students. The following four positions that are often used in daily clinical practice are investigated: (i) sitting with the arms supported at the right atrial level, (ii) standing with the arm supported at the right atrial level, (iii) supine position and (iv) supine position with legs crossed.

METHODS

A total of 157 healthy young adults who had consented to participate in the study were randomly selected. Participants were females aged 18–24 years. Subjects were excluded if they had heart disease or treated with drugs interfering with the autonomic nervoussystem.

All measurements were performed by the same researcher using the semi automated oscillometric devices, shown to give accurate readings. The Bosomat functions on the oscillometric principle: the mean arterial pressure (MAP) is determinedat the maximum amplitude of the oscillations and subsequentlythe systolic and diastolic BPs are computed from theMAP. Bosomat has an automatic cuff inflation and adjustabledeflation, both with a rate of 2–3 mmHg/second. We have programmed the Bosomat to inflate the cuff up to 200 mmHgin each patient. However, when this pressure was insufficientlyhigh according to the detected oscillations in a particular subject, the instrument automatically over inflated the cuff above the threshold of oscillations.In all subjects BP was measured subsequently in four positions: sitting BP was taken from the left arm, which wasflexed at the elbow and supported at the heart level on thechair. After at least one minute of standing, BP was thentaken standing, with the arm supported at the elbow and the cuff at the heart level. After one minute of rest, BP wassubsequently taken supine position. Finally, after one minute BP was again taken in this last position with supine position with crossed legs.

Statistical analysis

Statistical analysis was done using SPSS programme. Thedata were expressed as means ± SD. The repeated measures for ANOVA was used to compare the means in different positions. Adjustment for multiple comparisons was done by using the Bonferroni correction. The differences were considered statistically when $P < 0.05$ unless otherwise stated.

RESULTS

Table 1 shows the distribution of BP readings at the different positions. The BP tended to drop in the standing positionwhen compared with the sitting, lying with feet flat and lyingwith crossed legs. Systolic and diastolic BP was the highest insupine position when compared the other positions. Thedifference between the SPB in the supine position and other positions was statistically significant ($P < 0.001$), but therewas no statistical difference between diastolic BPs ($P > 0.05$). Table 2 shows the pairwise comparisons between fourpositions in systolic BP. All changes in systolic BP werestatistically significant except those from supine to supineposition with crossed legs.

Table 1: Blood pressure recordings for all positions.

Body positions	Mean systolic BP	Mean diastolic BP
Sitting position	102.8 ± 11.4	65.7 ± 8.2
Standing position	99.9 ± 10.2	66.0 ± 8.7
Supine position	107.9 ± 10.7	66.9 ± 9.6
Supine position with crossed legs	107.0 ± 8.6	66.7 ± 7.3

F = 44.4, P < 0.001 F = 1.3, P > 0.05

Table 2: Pairwise comparisons between positions in systolic BP.

	Sitting position	Standing position	Supine position
Standing position	*		*
Supine position	*	*	
Supine position with crossed legs	*	*	

*, the mean difference is significant at the level 0.05 level.

DISCUSSION

In the present study we have investigated the influence ofseveral body postures on the indirect BP measurements inhealthy young people. To obtain objective readings the BP was measured semiautomatically with an oscillometric device proven to register the BP accurately and reproducibly. The BP measurement in sitting position with thearm supported horizontally at the right a trial level is most often used in the general medical practice and hospital clinics, whereas in most hospital wards BP is often measured insupine position. Both diagnostic and therapeutic decisions are based on BP readings taken sometimes in sitting and sometimes in supine positions, since they are often regarded as equivalent. It has been recommended that the BP should be routinely measured having the patient comfortably seated, with the arm passively supported at the reference level of right atrium. In supine position, a significantly higher BP was obtained compared with the other positions in this study. Similarly, significantly lower BPwas obtained in the standing position with the arm supported at the level of right atrium. In another study, both systolic BP and diastolic BP were significantly higher in the supine position than in the sitting position. The position of the body is known to affect BP readings, with BP increasing successively from the supine to the sitting and the standing positions. In this study we observed a decrease in SBP and DBP from the sitting and supine to the standing. We found that both SBP and DBP were significantly higher in the supine than in the sitting position. Although there is a theoretical basis and studies that suggest crossing legs may increase BP, there was no statistical difference between those with crossed and uncrossed legs in this study.

CONCLUSION

The conclusion of this study was that body position affected the accuracy of BP measurement in healthy young adults.The present study shows that the assumption that BP insitting and supine position can be considered similar is incorrect even when the arm of the patient is placed at the correct right atrium level in both position, as officially recommended, as the sitting BP is significantly lower than the supine BP. In addition, although there were no significant differences between those who had their legs crossed vs.uncrossed, patients should be instructed about keeping feet flat on the floor during BP measurement.

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