THE PATTERN OF BLOOD PRESSURE OSCILLATIONS AND THEIR RELATION TO SYSTOLIC AND DIASTOLIC BLOOD PRESSURES IN HEALTHY ADULTS*

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INTRODUCTION

Notwithstanding the fact that auscultatory method is most ideal for determining the systolic and diastolic blood pressures, the palpatory and oscillatory methods are often taught to the students. Oscillatory method is particularly valuable in conditions of shock with arterial spasm and in healthy infants, where the Korotkov sounds are not distinctly heard (5). In adults in which the diastolic pressure cannot be determined by the change in character of the sounds the oscillatory method is often used for this purpose.

It has however been observed that there is no uniformity in descriptions regarding the pattern of blood pressure oscillations and its utility in determining systolic and diastolic pressures in an individual. As different patterns were observed in the course of teaching it was felt necessary to record such manometric oscillations during the determination of blood pressure in healthy human adults.

MATERIALS AND METHODS

The study was performed in 67 healthy male and female medical students of the age group varying from 18 to 23 years. The subjects were allowed to rest in the recumbent position for 15 minutes. The systolic pressures were first roughly estimated by palpatory method in every subject. Then three readings of systolic and diastolic pressures were taken by auscultatory methods at an interval of about 5 minutes. The sudden muffling of the sound was taken as a criterion of the diastolic pressure (7). The mean systolic and diastolic readings were found out. Ludwig's mercury manometer was used for the recordings. The oscillations of the mercury column were then recorded with the help of float on the slow moving kymograph. The pressure in the cuff was raised 20 mm of mercury above the systolic reading. It was slowly reduced and the oscillations recorded throughout. Systolic and diastolic pressures were marked on the drum paper during the course of oscillations. In every case the tracings were recorded till the level of mercury column reached about 20 mm below the diastolic pressure as determined by auscultatory method. The readings were taken in both the arms separately in every subject.

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As the manometric oscillations have been found to be influenced by deep breathing (Fig 2) the subjects were specially asked to avoid the same.

RESULTS

In all 134 recordings were studied in 67 subjects. The various patterns of oscillations obtained are shown in Fig. 1.

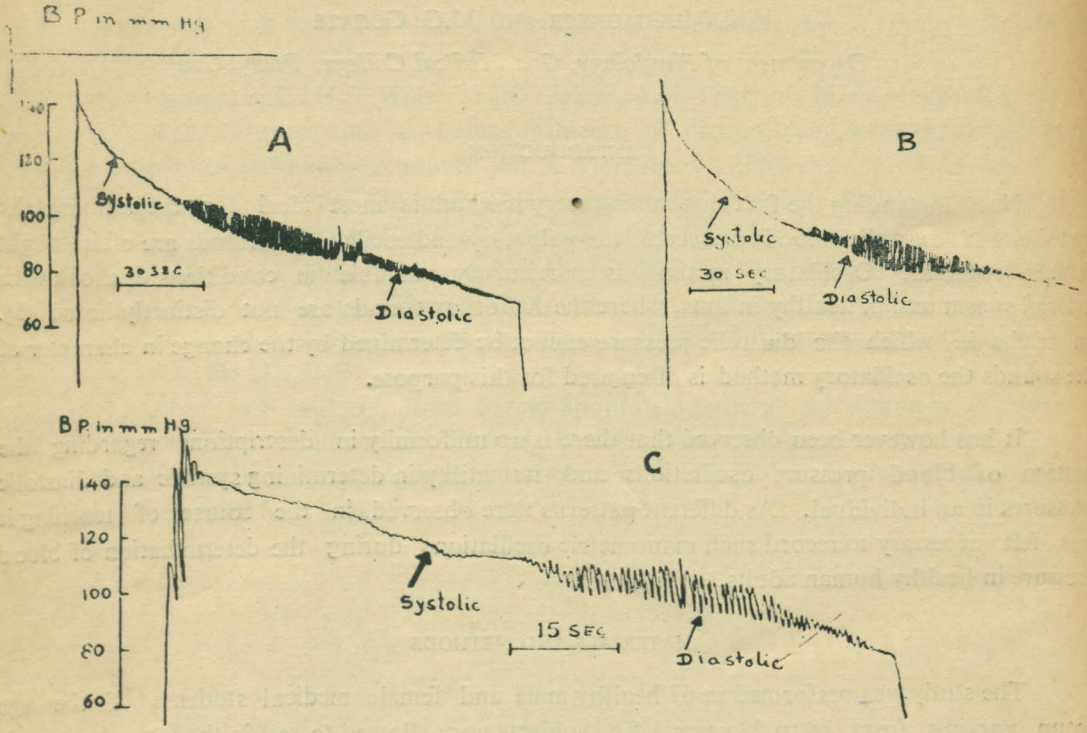

Fig. 1

It is observed that the blood pressure oscillations show a spindle-shaped pattern in all the subjects irrespective of the level of systolic and diastolic pressures as determined by the auscultatory method. In many subjects it was further observed that the patterns on the right and left arms were not identical. This was confirmed on repeated readings. For this reason readings on both the sides were treated separately. Table 1 records the incidence of patterns in the readings thus studied.

TABLE 1

Patterns of manometric oscillations in 134 readings obtained in right and left arms in 67 subjects

Pattern	*No. of readings obtained*	*Approximate percentage reading*
A	77	57.46
B	14	10.45
C	43	32.09

Fig. 2 records variations in oscillations during the respiratory phases when the subject was asked to take slow and deep breaths.

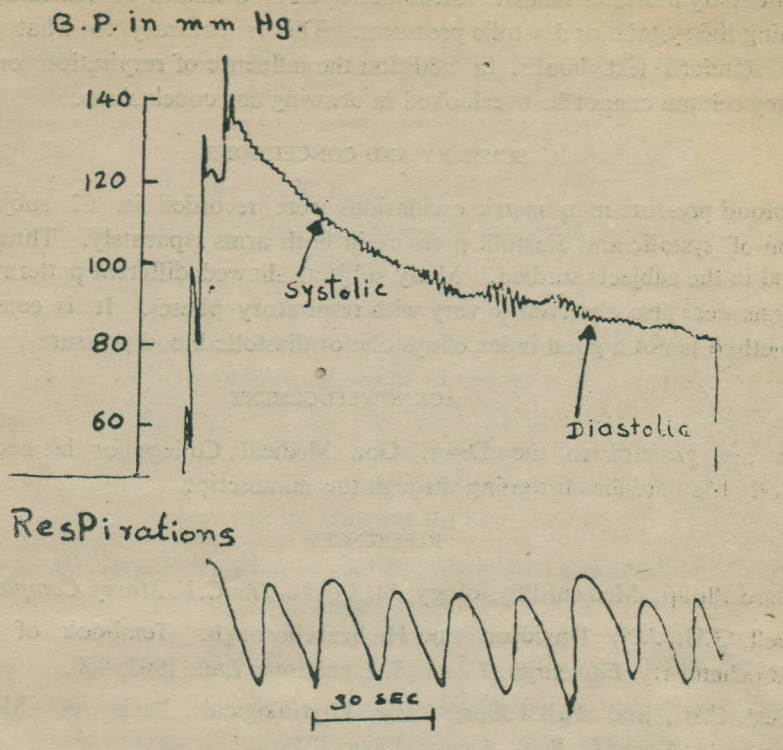

Fig. 2

Variations in blood pressure manometric oscillations during deep respirations-inspirations downward.

DISCUSSION

It is observed that there is no uniformity in statements regarding the validity of oscillometric method as an index of diastolic pressure. That the oscillations appear more prominently at the level of systolic pressure and progressively increase reaching their maximum at the diastolic pressure had been the standard description (2,4,8). The blood pressure oscillations showing a sudden increase in amplitude together with appearance of radial pulse as detected by palpation was taken as a criterion of systolic blood pressure. The first appearance of oscillations as detected by an oscillometer has also been considered as an index of systolic pressure (5,8). It was however noted in the present series that minute oscillations were observed in many subjects when the blood pressure was kept above the systolic level. The oscillations show only a little change in magnitude as the pressure is slowly lowered till it reaches the diastolic level at which they suddenly beeome smaller (3,8). It is further documented that the oscillatory waves reach a maximum near the mean pressure and show a sudden reduction in size as the armlet pressure falls below the diastolic level (1,5,6). The size of fluctuations is further influenced by respirations (1). This has been confirmed during our studies (Fig. 2).

Present study indicates that the oscillometric method cannot be treated as a reliable one for determining the systolic or diastolic pressures. This is contrary to what is described in some of the standard text books. In addition the influence of respiration on the oscillations of the mercury column cannot be overlooked in drawing any conclusions.

SUMMARY AND CONCLUSIONS

The blood pressure manometric oscillations were recorded in 67 subjects during the determination of systolic and diastolic pressure in both arms saparately. Three main patterns were observed in the subjects studied. Many subjects showed different patterns in two arms. The oscillations were also observed to vary with respiratory phases. It is concluded that the oscillatory method is not a good index of systolic or diastolic blood pressures.

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