PALPATORY ESTIMATION OF BLOOD PRESSURE

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It has been known for a long time that the blood pressure can be ascertained at the wrist by palpating the radial pulse manually (1). This is easily performed and can be accurate to within 10 mm. Hg. in a large majority of cases. The wide availability of the sphygmamanometer and its greater accuracy have led the doctors to neglect this aspect of examination. Furthermore, in the detection of hypertension, the diastolic pressure has been regarded as the more important one, and this is generally accepted as not estimable by manual palpation (1).

However, measurement of blood pressure necessitating the use of an instrument takes time, and hence the blood pressure is seldom taken as a routine by doctors except in few specific instances, and even in specialist clinics in teaching institutions, the blood pressure of a patient is seldom taken every time a patient is seen. If however, palpatory method is reliable, then blood pressure estimation would be made and recorded as a routine, and be of considerable value in the understanding of the epidemiology and treatment of hypertension. For this to become a reality, the palpatory method must satisfy two conditions: firstly, it must be able to estimate reliably both the systolic and diastolic pressures, and secondly, it must be a method easy to learn and practise.

The standard way of estimating systolic blood pressure by palpation is to occlude the pulse at the wrist with the fingers, and estimate the pressure, when the pulse is totally occluded. The Chinese physician's way of pulse palpation is ideal. This is done by placing the pulps of the index, 3rd finger and 4th finger over the radial pulse at the wrist (2).

The diastolic pressure (D) represents the pressure in t he arteries after the closure of aortic valves. It is the net result of the systolic pressure (S) minus the dissipation of pressure on overcoming the elasticity of the aorta (E) and peripheral resistance (R) i.e.

$$S - (E + R) = D.$$

Diastolic pressure (D) is responsible for keeping the blood flowing when the heart is not contributing a propulsive force, and the momentum to do so is principally due to the elastic recoil of the aorta (E). *It keeps the arteries patent and therefore the pulse palpable.* In palpation of the pulse, the operator presses down on the soft tissue of the wrist until he can feel the arterial pulse. Then he exerts more pressure till he occludes the pulse to estimate the systolic pressure.

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Since the diastolic pressure (D) is the force that keeps the arteries patent and the pulse palpable, it follows naturally that the moment the fingers can feel the pulse, the force exerted by the fingers would be equivalent to the diastolic pressure. Hence, one only has to estimate the pressure when the pulse is first felt, and when it is totally occluded to get at both the diastolic and the systolic pressures by palpatory methods. Of course, these readings will not necessarily be an *exact* reflection of the true intra-arterial measurements, but it should correlate closely with the readings obtained by a sphygmomanometer.

An experiment is therefore designed to verify the following:

1. Is estimation of diastolic pressure by palpatory method possible?
2. Is the method easy to learn and practise.
3. Is the reading so obtained reliable when compared with the measurements made by sphygmomanometer.

METHODS

Ten preliminary readings were made to accustom the operator to the palpatory method. Then 50 cases were estimated by both palpatory and auscultative methods. These cases comprise small groups of consecutive cases of three or four each day. Apart from the first 10 preparatory preliminary runs, no further preparation or warming up was made. Each case was examined by palpatory method first, the estimation recorded in units of 5 mm. Hg., then the same case was immediately measured with a sphygmomanometer, and the systolic and diastolic pressures were read and recorded also in units of 5 mm. Hg. respectively. The patients are not told of the experiments, and are in this sense blind. The operator is not similarly blinded as there is no motivation to find either for or against the results.

RESULTS

The readings are tabulated in table one.

The age range is from 10 to 74 years with 23 males and 27 females. The range of systolic pressure encountered by auscultatory method is 80 mm. Hg., to 190 mm. Hg., and the diastolic pressure is 45 mm. Hg. to 120 mm. Hg. Where the readings of palpatory* and auscultatory methods agree within 10 mm. Hg. for the systolic or 5 mm. Hg. for the diastolic, the palpatory method is regarded as accurate. Where the disagreement is larger than 20 mm. Hg. for the systolic, or 10 mm. Hg. for the diastolic, the palpatory method is regarded as unacceptable.

11 systolic pressure readings agreed in toto.

14 systolic pressure readings were accurate.

24 systolic readings were unacceptable.

1 systolic reading was acceptable.

Of the unacceptable readings, only 14 can be regarded as being large enough errors, and only 5 would have

converted a normo-tensive to hypertensive, and vice versa, i.e. false positive or negative.

In the diastolic pressure readings:

17 agreed in toto.

6 regarded as accurate.

7 regarded as acceptable.

19 regarded as unacceptable.

Of the 19 regarded as unacceptable, 9 would have converted a normotensive to hypertensive or vice versa.

Very large errors occurred in 3 out of 50 instances of systolic readings, and 1 out of 50 instances of diastolic readings. These data would suggest that using palpatory method, the error of missing or mislabelling a hypertensive is only 5/50 (10%) in the assessment of systolic pressures, and 9/50 (18%) in diastolic pressures. Considering the effort involved in taking blood pressure in the usual way — getting a blood pressure set and taking several readings over a period of time, a principal reason why the blood pressure is not taken as a routine in every consultation of all doctors, then the palpatory method would seem worth acquiring in view of the error margin being not excessive and its simplicity.

It may be argued that the scatter of blood pressure may be such that unconscious restriction to a certain range, or even purposeful confinement to the range would show a similar result. Thus, if most cases have blood pressures of 100 to 120/70 to 80, then by merely guessing within these ranges, the scores would be high. Table 2 shows that in fact there is little evidence of such bias in the scatter. Even more reassuring is the fact that 11/50 systolic pressures and 17/50 diastolic pressures coincide entirely. This capacity for accuracy with only a little training is encouraging, and makes a chance occurence extremely remote. It remains to be seen if practice can improve the accuracy, but even with this much, there would appear to be a place for the mastery of palpatory method in the estimation of blood pressures. Further, it would seem to show that the palpatory method is capable of estimating the diastolic pressures just as well as the systolic pressures.
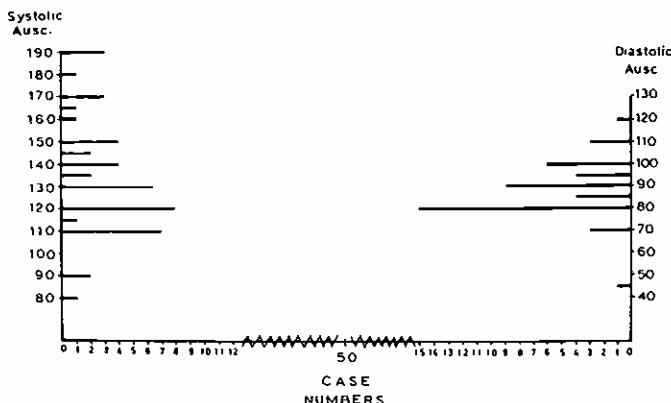
Table 2

CASE NUMBERS

Table 1   N = 50   Age 10 - 70   * F

Systolic Palpatory	Systolic Auscult.	Difference	Diastolic Palpatory	Diastolic Auscult.	Difference
140	150	+10	90	90	0
2000	170	-30	130	120	-10
140	175	+35	80	100	+20
100	90	-10	70	70	0
130	130	0	80	80	0
140	120	-20	70	80	+10
110	110	0	85	85	0
160	130	-30	80	100	+20
140	130	-10	90	100	+10
120	145	+25	70	95	+15
120	120	0	70	75	+ 5
180	190	+10	100	110	+10
170	140	-30	100	95	- 5
130	115	-15	80	85	+ 5
180	170	-10	90	90	0
100	140	+40	60	90	+30
180	160	-20	70	100	+30
120	110	-10	80	80	0
120	120	0	80	80	0
100	80	-20	160	110	-50
130	130	0	70	90	+20
140	120	-20	80	80	0
170		-20	80	95	+15
130	130	0	80	80	0
120	130	+10	80	90	+10
170	170	0	80	110	+30
90	120	+30	60	80	+20
110	110	0	70	80	+10
160	190	+30	90	95	+ 5
180	190	+10	100	120	+20
160	110	-50	100	80	-20
140	110	-30	80	80	0
140	145	+ 5	80	100	+20
140	180	+40	80	80	0
120	140	+20	80	100	+20
110	120	+10	80	80	0
120	120	0	80	80	0
170	140	-30	90	75	-15
150	130	-20	80	80	0
150	150	0	90	90	0
130	120	-10	70	70	0
120	150	+30	80	110	+30
140	140	0	100	90	-10
130	150	+20	80	85	+ 5
90	110	+20	60	80	+20
100	110	+10	70	70	0
200	170	-30	110	90	-20
100	120	+20	70	90	+20
130	135	+ 5	80	85	+ 5
80	90	+10	60	45	-15

Range systolic pressure 80 xxx 190 interval of 10.
Range diastolic pressure 45 xxx 120 interval of 5.

Theorectical systolic range 70 xxx 250 - 18 intervals.
Theorectical diastolic range 0 xxx 150 - 30 intervals.