

Palpatory Method of Measuring Diastolic Blood Pressure

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ABSTRACT

Background: Most common method for measuring blood pressure is palpatory but only systolic pressure can be measured with this method. In this study we are describing palpatory method of measuring diastolic blood pressure as well.

Patients & Methods: We have studied in 200 patients and compared systolic as well as diastolic blood pressures with two methods, auscultatory and palpatory. Systolic and diastolic blood pressure were measured by one of the authors with new palpatory method and noted down. Then an independent observer, who was blinded to the palpatory method's values, measured blood pressure by auscultatory method and noted down. The values were compared in term of range and percentage.

Results: The difference were analysed and found that 102 (51%) patients had systolic and diastolic blood pressure measured by palpatory method, within ± 2 mmHg of auscultatory method, 37 (19%) patients had within ± 4 mmHg, 52 (25%) patients had same readings as with auscultatory method, and in 9 (0.5%) patients it could not be measured.

Conclusion: The palpatory method would be very useful where frequent blood pressure measurement are being done manually like in wards, in busy OPD, patient on treadmill and also whenever stethoscope is not available. The blood pressure can be measured in noisy environment too.

KEYWORDS: Auscultatory method, Arterial blood pressure, Diastolic blood pressure, Palpatory method

Arterial blood pressure is one of the "vital signs" and an important sign of a person's state of health; therefore, its measurement is a part of every complete physical examination. Any variation in blood pressure from normal either low or high is indicator of poor health. Systolic pressure and Diastolic pressure are equally important for normal blood circulation in the body.

The gold standard for measurement of arterial blood pressure is direct intra-arterial measurement with a catheter (invasive method). But, the indirect methods of measurement are more commonly used like palpatory and auscultatory method, which uses sphygmomanometer and stethoscope for the pressure measurement. The direct and indirect methods yield similar measurements, but these are rarely identical because the direct method measures pressure, while the indirect methods are more indicative of flow¹. Although indirect method is generally less accurate and less reproducible, it is sufficiently accurate for many diagnostic and therapeutic studies and will continue to be used because it is simple, low in cost, and noninvasive. There are numerous methods presently in practice for measurement of arterial blood pressure –

A. Palpatory method - Inflate the cuff rapidly to 70 mm Hg, and increase by 10 mm Hg increments while

palpating the radial pulse. Note the level of pressure at which the pulse disappears and subsequently reappears during deflation will be systolic blood pressure.

B. Auscultatory method - The Russian physician "Korotkoff" first described the auscultatory method in 1905.² In this method the cuff is inflated to a level above arterial pressure (as indicated by obliteration of the pulse). As the cuff is gradually deflated, the pressure is noted at which sounds produced by the arterial pulse waves (Korotkoff sounds) appear and disappear again as flow through the artery resumes. The appearance of the first Korotkoff sound is the maximum pressure generated during each cardiac cycle: the systolic pressure. The level of pressure at which the sounds disappear permanently, when the artery is no longer compressed and blood flow is completely restored, is the resting pressure between cardiac contractions: the diastolic pressure." As the pressure is reduced during deflation of the occluding cuff, the Korotkoff sounds change in quality and intensity. The five phases of this change are characterized as follows:²

Phase 1: First appearance of clear, repetitive, tapping sounds. This coincides approximately with the

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reappearance of a palpable pulse.

Phase 2: Sounds are softer and longer, with the quality of an intermittent murmur.

Phase 3: Sounds again become crisper and louder.

Phase 4: Sounds are muffled, less distinct, and softer.

Phase 5: Sounds disappear completely.

The pressure at which the sounds first appear (onset of Phase 1) corresponds to the systolic pressure, disappearance of sound (Phase 5) best corresponds with diastolic blood pressure³ and also correlates better with intra-arterial pressure. Identification of systolic blood pressure by palpatory method helps one to avoid a lower systolic reading by auscultatory method if there is an auscultatory gap.

- C. Oscillometric method:** This technique uses appearance and disappearance of oscillation in manometer or through the sensors.¹ The term NIBP, for Non-Invasive Blood Pressure, is often used to describe oscillometric monitoring equipment (automated electronic blood pressure monitors).
- D. Invasive measurement:** Arterial blood pressure is most accurately measured invasively through an arterial line. Invasive arterial pressure measurement with intravascular cannula involves direct measurement of arterial pressure by placing a cannula needle in an artery (usually radial, femoral, dorsalis pedis or brachial).⁴ The cannula must be connected to a sterile, fluid-filled system, which is connected to an electronic pressure transducer. The advantage of this system is that pressure is constantly monitored beat-by-beat.
- E. Other methods:** Ultrasonic method,^{1,4} Tonometry method etc are other methods to measure blood pressure but not in common practice.

PATIENTS & METHODS

In present study we are describing a palpatory method to measure systolic as well as diastolic blood pressure. It requires only sphygmomanometer as instrument.

The Palpatory Method to Measure Diastolic Blood Pressure:

1. Place the patient in a comfortable position, sitting or lying, with forearm supported and the palm upward.
2. Expose the arm for about five inches above the elbow. Remove any restrictive clothing from the arm.
3. Place centre rubber bladder of cuff over brachial artery and wrap cuff firmly and smoothly around the arm, one inch above the bend of the elbow (antecubital space). Position arm so cuff is at heart level.
4. With the first three fingers, find the radial pulse.
5. Inflate the cuff to about 30 mmHg above the pressure

at which the pulse disappears.

6. Keep your first three fingers of nondominant hand lightly over the bend of the elbow at medial side of antecubital fossa, so that palmar surface of distal digits of these fingers make firm contact with antecubital fossa. Do not try to feel pulse of brachial artery. (Figure 1, Figure 2)
7. Deflate the cuff slowly.
8. While deflating the cuff a pulsatile thrill can be palpated, the pressure at which thrill appears is a systolic pressure and, the disappearance of the thrill is the Diastolic Blood Pressure.



Figure 1

Pictures showing method to place fingers at antecubital fossa



Figure 2

Closer view showing method to place fingers at antecubital fossa

Mechanism: When the cuff of a sphygmomanometer is placed around a patient's upper arm and inflated to a pressure above the patient's systolic blood pressure, and a stethoscope is placed over the brachial artery in the antecubital fossa in a normal person (without arterial disease), no sound should be audible. If the pressure is dropped to a level equal to that of the patient's systolic

blood pressure, the blood starts flowing through the brachial artery with turbulence flow, which produces thrill and can be palpated with palmer surface of the fingers. As the cuff pressure dropped to a level of diastolic blood pressure the flow becomes laminar flow and the thrill characteristic of pulse disappears or pulse become soft and then disappears very shortly. One can learn to differentiate by experience the purring nature of thrill from soft nature of pulse before disappearance.

Study and Analysis: For study and analysis 200 adult patients of both sexes, during exercise in treadmill, preanaesthetic checkup and intraoperative period, were selected. Systolic and diastolic blood pressures with palpatory method and auscultatory method were compared on single upper limb either side. Systolic and diastolic blood pressure were measured by one of the authors with new palpatory method and noted down. Then an independent observer, who was blinded to the palpatory method values, measured blood pressure by auscultatory method and noted down. The difference were analysed and found that 102 (51 %) patients had systolic and diastolic blood pressure measured by palpatory method, within + 2 mmHg of auscultatory method, 37 (20 %) patients had within + 4 mmHg, 52 (25 %) patients had same readings as with auscultatory method, and in 9 (0.5 %) patients it could not be measured. Out of 9 patients, 5 were severely morbid, 3 were geriatric patients of age more than 70 years and one was having aortic regurgitation.

DISCUSSION

Palpatory method is most commonly used method in wards and OPD but it has limitation of measuring systolic pressure only. Diastolic pressure is a very important part of blood pressure and palpatory method is very easy and quickest method for measuring blood pressure. If we can incorporate diastolic pressure in palpatory method it would become very useful and popular method. Advantage of the technique is that it only requires sphygmomanometer. This technique will also be very useful where frequent BP measurement are being done manually like in wards, in busy OPD, patient on treadmill and during cardiac pulmonary resuscitation. D Perloff et al¹ have also mentioned in special report about inability to measure blood pressure during treadmill

accurately with auscultatory method. This method can also be used to measure diastolic pressure whenever stethoscope is not available or not working and, in absence of automated blood pressure monitor. The blood pressure can be measured in noisy environment too. Limitations of the palpatory methods are shivering, tremor, severe obesity, and moderate to severe hypotension. Shivering and tremor causes mechanical interference in measurement. In severe obese thick subcutaneous fat probably prevent thrill to transmit to surface. Elderly patient have very thin subcutaneous fat, which leads to continuous palpation of pulse throughout measurement and pose difficulty to identify thrill in pulse. However with experience one can learn to appreciate appearance and disappearance of thrill, can overcome the failure in elderly. Jules constant⁵ has also described a palpatory method to measure diastolic pressure. As this is a probably first study, further studies are required to compare the results.

CONCLUSION

Though the gold standard for measurement of arterial pressure is invasive intra-arterial technique, the most frequently used method in practice is palpatory method especially in wards. The new palpatory method described here will enable systolic as well as diastolic blood pressure measurement to be done without sphygmomanometer.

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