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Sphygmomanometers: Technological Advancements and Significance in Diagnostics

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Abstract:

Sphygmomanometer is considered as one of the most important, portableblood pressure (BP) measuring(diagnostic) devicewhich is commonly available at every health care unitas far as health is concerned. According to the technological changes, sphygmomanometers are also modified according to ease of examination. Themercury sphygmomanometer has remained the 'gold standard' amongBPmeasuring devices. But for the concern of environment and health of all, it was replaced/ modified into the aneroid sphygmomanometer and digital sphygmomanometer. This change also focused on the accuracy of results and minimal inconvenience to the patient. This review is constructed to focus on the accuracy, advantages and disadvantages of the sphygmomanometers.

Keywords: Blood pressure, Sphygmomanometer, Types of sphygmomanometers.

Introduction:

The pressure of blood pushing against the wall of arteries is called as BP. BP can rise and fall throughout the day.BP of 120/80 mm of Hg is considered normal.The rise in BP is called as hypertension, which is caused due to psycho-somatic stress, older age or certain health issues like chronic kidney disease, sleep apnea etc. The fall in BP is called as hypotension which is mainly caused due to physiological change causing factors like pregnancy, heart failure, liver disease etc. Alteration of BPcan be suggestive of underlying other health issues and therefore sphygmomanometers have a crucial role in healthcare fraternity. Faulty devices, improper body posture, wrong techniques of assessment of BPmay result in wrong, missed or abnormal BP readings. Therefore, accuracy of BP that is assessed is important in early identification and treatment.

Aim:

Sphygmomanometerisan important tool for assessing the BP for diagnosis and management. This review aims at gaining information and understanding functioning of various types of sphygmomanometer and their technological advancement as diagnostic devices.

Objective:

To develop understanding about the accuracy, advantages, disadvantages, reliability of various types of sphygmomanometers.

Material and methods:

References of mercury sphygmomanometer, aneroid sphygmomanometer, digital sphygmomanometer have been collected, compiled, analyzed and discussed for authentic sources and research articles.

Discussion:

Overview about various sphygmomanometers including mercury sphygmomanometer, aneroid sphygmomanometer, digital sphygmomanometer is discussed as follows.

Mercurysphygmomanometer*:*

Von Basch created the sphygmomanometer and the first non invasive BP measurements in 1881. Scipione Riva- Rocci developed the mercury sphygmomanometer in 1896, as we know today.It consists of an inflatable rubber bladder along with a column with readings.In the measurement procedure, a cuff is wrapped around aeither upper arm with an inflatable rubber bag inside the cuff centered over the brachial artery. Enough air is pumped into the cuff to pressure over the artery. The thumb valve given in the pump is used to relive air gradually. When the pressure in the cuff is equal to the pressure on the artery, the artery opens and the blood begins to return to the part of the artery that was closed. As the blood returns to the artery, pulse sounds begin. To listen to the sound, bell of the stethoscope is place on the point of brachial artery. The sound continues for a timetill the cuff is deflated slowly, eventually fading away.This sound is well known as Korotkoff sounds.If used properly the device is safe for the handler as well as patients. Mercury is a metalthat may add toxic vapors to atmosphere if exposed to air. Temperature, ventilation, and sunlight affect the level of the vapor's concentration. Mercury vapors can permeate the skin surface and are poisonous if inhaled[1]. Therefore these devices can last long without any health hazard if handled properly.

Aneroid sphygmomanometer

Aneroid sphygmomanometer was introduced by Von Basch. These types of sphygmomanometersare assembled with a stethoscope, cuff and a dial gauge with tube. First, the stethoscope is attached to the cuff then the cuff is attached to the dial gauge with a tube to transfer the pressure in cuff to the pressure gauge.As these types of blood pressure measuring devices do not contain any liquid substances like mercury, these prove beneficial in terms of maintenance, environmental and health safety. As far as accuracy is concerned the aneroid sphygmomanometers provides readings of high accuracy as long as proper protocol is followed for its maintenance[2]. It's a lightweight device and hence portability is quite easier. The contrasts between mean mercury sphygmomanometers and aneroid sphygmomanometerBP readings were observed to be measurably huge (P-esteem <0.01). The mean systolic pulse (SBP) readings of the two gadgets were still essentially connected ($r = 0.989$; $P < 0.01$). Essentially, the mean diastolic circulatory strain (DBP) readings were additionally fundamentally corresponded ($r = 0.988$; $P < 0.01$). The aneroid gadget distinguished a higher extent of hypertensive members contrasted with the

mercury gadget[3,4]. In one research study, distinction in the two gadgets utilized was observed to be critical; in any case, the readings were related with one another. The Aneroid sphygmomanometerfundamentally misjudged BP readings, in this manner recognizing a higher extent of hypertensive when contrasted with the mercury device. There is an impressive opportunity to get better in the precision of the Aneroid sphygmomanometer, really at that time an exact and an all around aligned Aneroid sphygmomanometer could give an adequate option in contrast to the utilization of the mercury device.[5,6.]

Digital sphygmomanometer

Digital sphygmomanometer may use a cuff around upper arm, wrist or finger in order of accuracy, convenience and portability[7]. Digital sphygmomanometer utilizes oscillometric estimations and electronic computations rather than auscultation. It may not be advised in some patients suffering from pulsus paradoxus, arrhythmiaand pre-eclampsia. By oscillometric detection, the systolic and diastolic pressure is measured.

Conclusion:

The mercury sphygmomanometer is the gold standard measuring device so far,as far as accuracy is concerned. But it is phased out because of its poor maintenance and environmental issues. Though the mercury sphygmomanometers are best to use but as there are technological advancements nowadays the aneroid sphygmomanometers have come into existence. The results and readings differ but still the aneroid sphygmomanometers are much better than the digital sphygmomanometers.Though the digital sphygmomanometer is easy to use and does not require any expertise but still it is not up to standard. There is a risk of people getting misdiagnosed of hypertension. As far as detection, management and treatment of hypertension are concerned the digital sphygmomanometer may prove disastrous if used by health personnel for detection of hypertension.

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