

College of health and medical techniques/ anaesthesia techniques

Dep. 3rd stage ICU lectures

Cardiovascular assessment

c. blood pressure measurement.

general considerations:

- ❖ All pt. in the ICU and who take general or regional anesthesia it is absolutely indication for arterial blood pressure measurement
- ❖ The techniques and frequency of pressure determination depend largely on the pt. condition and type of surgical procedure or diseases that he have
- ❖ An auscultatory measurements every 3-5 minutes is adequate in most cases
- ❖ Problems such as morbid obesity make auscultation unreliable however in such cases, another technique may be preferable
- ❖ Techniques that rely on a blood pressure cuff are best avoided in extremities with vascular abnormalities e.g. Dialysis shunt or intravenous line
- ❖ Any major deviation from normal preoperative values will requires attention particularly. If it is accompanied by other cardiovascular abnormalities such as poor peripheral perfusion or changes in heart rate or rhythm
- ❖ arterial blood pressure should be viewed as an indicator- but not a measure –of end organ perfusion

Clinical aspects of blood pressure

1. Blood pressure (BP) is an important measure of a patient's physiological well-being. Blood pressure can be measured *non-invasively* with:

A. Sphygmomanometer and stethoscope

i. blood pressures are measured against a reference point called the *isophlebotic point*, which is at the same level as the right atrium. In a supine patient the isophlebotic point is located where the fourth intercostal space crosses the midaxillary line.

always notes – the proper size of cuff, the width of the cuff bladder should be 20% greater than the arm's diameter (too narrow cuff may produce a large over estimation of systolic blood pressure while the wider cuff may under estimate the systolic pressure)

ii. Pulse pressure is the difference between systolic and diastolic blood pressure reading. normally about 35-45 mmHg depend on

- Stroke volume
- Compliance of the arterial tree; e.g. increase in elderly because of arterial calcification and reduced compliance
- Duration and speed of ventricular ejection.
- Aortic valve function.
- Site of measurement; increase as the arterial waveform moves peripherally

Decrease in pulse pressure may indicate falling cardiac output and is there for useful evaluation of the patient perfusion state

iii. Measurement of arterial blood pressure is greatly affected by sampling site. As a pulse moves peripherally through the arterial tree Leading to exaggeration of systolic and pulse pressure e.g. Radial artery systolic pressure is higher than aortic pressure but in contrast with cardiopulmonary bypass because of decrease in hand vascular resistance and vasodilator drugs e.g. (isoflurane, nitroglycerine) tend to accentuate this discrepancy

IV. The level of sampling site relative to the heart will alter measurement of blood pressure because of the effect of gravity

V. Some patients with severe peripheral disease may have a significant difference in blood pressure measurements between the right and left arms (so the higher value should be used in these patients)

B. Oscillometry (oscillotonometer). this is satisfactory only when the pt. is anesthetic, arterial pulsations cause oscillations in cuff pressure, these oscillations are small if the cuff is inflated above systolic pressure, however the pulsations are transmitted to the entire cuff and oscillation markedly increase. Maximal oscillation occurs at the mean arterial pressure, after which oscillation decrease Atrial fibrillation and arrhythmias affect performance of this device, and also external pressure on the cuff or its tubing can cause inaccuracies

It should not be used on pt. being transfused with heart lung machine
Frequently repeated cuff inflation can cause ulnar nerve palsy and petechial hemorrhage of the skin under cuff

C. Plethysmography (finapress); continually measures the minimum pressures required in a small finger. It has proven unreliable in pt. with poor peripheral perfusion (peripheral vascular disease or hypothermia)

D. Doppler. A Doppler probe transmits an ultrasonic signal that is reflecting by underlying tissue. The difference between transmitted and received frequency is represented by this monitor's characteristics switching sound which indicate blood flow

A gel must be applied between the probe and the skin, correct positioning of the probe directly above the artery is vital since the beam must pass through the vessel wall

Interference from probe movement or electrocautery is an annoying distraction, and it is sensitive enough to be useful in obese pt., pediatric pt. and those who are in shock

Note that only systolic pressure can be reliably determined with the Doppler technique

E. Arterial tonometry. blood pressure measurement by sensing the pressure required to partially flatten a superficial artery that is supported by bony structure e.g. Radial artery

Tonometry consisting of several independent pressure transducers is applied to the skin overlying the artery

The contact stress between the pressure transducer directly over the artery and the skin reflects intra luminal pressure. Continuous pulse recording produces a tracing very similar to an invasive arterial blood pressure

Current limitations on this technology include sensitivity to movement artifact and the need for frequent calibration

F. automatic blood pressure monitors using one or a combination of the methods described above are frequently used in Anaesthesiology and intensive care. through a self-contained air pump inflates the cuff at predetermined intervals. a nerve palsies and extensive extravasation of intravenously administered fluids could occur so one should have alternative one.