

Second 2008  
VIVA 3

You were asked by an intensive care nurse whether you would like to start some antihypertensive treatment for an ICU patient who had a very high arterial blood pressure (systolic 180mmHg, diastolic 60mmHg) displayed on the invasive haemodynamic monitor at the bedside. The ICU nurse said that the non-invasive oscillometric blood pressure monitor (systolic 140mmHg and diastolic 80mmHg) was much lower than the invasive blood pressure. Can you explain how a non-invasive oscillometric blood pressure monitor works?

This viva explored the candidates' knowledge in relation to the following points

Principles of oscillometric blood pressure measurements, factors affecting accuracy

Principles of invasive blood pressure measurement, factors affecting accuracy, resonance and damping

Examination feedback: All candidates had a good understanding of the principles behind oscillometric blood pressure monitoring and its pitfalls. A good understanding on invasive blood pressure monitoring was also essential to pass this viva. The common weaknesses were 1) the effects of the intra-arterial catheter size or bore, catheter length, and compliance of the tubing on resonance and damping; 2) how to assess the damping factor at the bed side; and 3) what is the minimal requirement in terms of natural frequency of the measuring system in relation to the frequency of the blood pressure waveform to prevent resonance. Most candidates found it difficult to convert a heart rate of 60 per minute into frequency in Hz.

**“Please describe Oscillometric blood pressure measurement”**

uses a single cuff and a signal transducer to measure oscillations

onset of oscillation is systole, peak oscillation is MAP, offset is diastole

limitations relate to inaccuracies at very low and very high pressures and with arrhythmias

von rechlinghausen uses two cuffs to do the same thing (one is for pressure and one for measurement)

DINxAMAP device for indirect noninvasive automated mean arterial pressure

**“What are the main components in the setup for invasive intra-arterial blood pressure measurement?”**

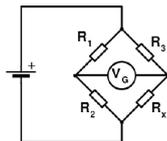
Involves an interarterial cannula in continuity with a column of heparinised saline, and a transducer

**“What is a transducer and what type of transducer is used in IABP?”**

Transducers convert one kind of energy to another

the strain gauge is most commonly used in IABP

a wheatstone bridge may be employed to more accurately assess the change in resistance



**“What determines the natural frequency of a IABP system and how may it be checked?”**

dependent on the length, diameter and compliance of the cannula, the density of the fluid

it is usually around 200Hz but is reduced by the addition of three way taps, bubbles etc.

if it gets down to 25Hz then it will interfere with the recording

it can be checked with a fast flush test

**“Describe static calibration”**

zeroing the transducer, adjusting for gain, checking for time stability

zeroing is removing the atmospheric pressure from the measurement

levelling is setting the measurement at the same height as the patient

**“Describe dynamic calibration”**

adjusting the resonant frequency and damping coefficient

resonant frequency - is the freq at which the system would oscillate if disturbed

damping co-efficient is the amount of damping and affects the sys/diastolic no.s

it is the property which decreases the magnitude of the oscillations

if it is zero the system will continue to oscillate

critical damping = 1, there is no overshoot but the system takes time to settle

optimal damping = 0.64, minimal overshoot and quick