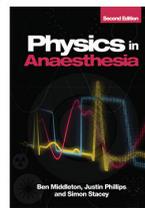


Chapter 16

Blood flow measurement



Self-assessment questions

These questions and answers, in both MTF and SBA formats, accompany *Physics in Anaesthesia 2e* and link back to the book for guidance.

©2021, Scion Publishing Ltd.
www.scionpublishing.com

Multiple true / false questions

For each of the following questions, mark all answers as either true or false

1. Using indocyanine green (ICG) dye for cardiac output measurement:

- Requires a radial artery catheter
- Requires transoesophageal access
- The second peak in the washout curve is due to dye flowing in the opposite direction to the main flow
- Allows for frequent measurement
- Is more accurate than using a Swan–Ganz catheter

Did you know?

- ICG dye can be used in techniques assessing hepatic function, liver and gastric blood flow, retinal angiography and even sentinel lymph node navigation in cancer patients.

2. Pulmonary artery catheters:

- Are the gold standard for cardiac output measurement
- Have a balloon inflated with air
- Use dye washout curves
- Require the temperature of injectate and time of injection to be known
- Have a thermistor proximal to the injectate port

Pointer

- Risks associated with this method involve those relating to the insertion of catheter and those relating to its residence in the artery.
- More serious complications include pulmonary embolism and infarction, cardiac mural thrombi, valvular injury, infection, and pulmonary artery rupture.

3. Laser Doppler flowmeters:

- Measure blood flux which is equal to the velocity multiplied by the vessel density
- Require an impedance-matching gel to work most effectively
- The resultant Doppler shift is directly proportional to the blood velocity
- Cause heating of the tissue, so must be used with caution
- Use sound with frequencies in the 1014 Hz range

Reminder

- Clinical uses of Doppler include the use of both light and sound waves.

Reminder

Pointer

- See *Chapters 23* and *24* for more clinical uses of these electromagnetic waves.

Single best answer questions

For each of the following questions, select the single best answer – note that more than one answer may be true but only one option represents the best answer

1. In the circulatory flow model what does the area under the washout curve equate to?

- a. Amount of dye injected divided by cardiac output
- b. Amount of dye injected multiplied by cardiac output
- c. Flow rate of dye
- d. Velocity of blood cells
- e. Sound frequency in MHz

Pointer

- See Equation 16.6.

2. In measuring cardiac output how does the method of lithium chloride dilution differ from the dye dilution technique?

- a. Less invasive
- b. Less frequent measurements are possible
- c. Has a larger recirculation peak
- d. Does not need calibrating
- e. Uses an electrochemical ion detector

Pointer

- Non-invasive and minimally invasive cardiac output monitoring methods have meant Swan–Ganz catheters are now used less frequently.

3. What is true of Doppler velocity and flow measurement?

- a. Continuous-wave Doppler systems measure blood direction and velocity
- b. Continuous-wave Doppler systems are more accurate than pulsed systems
- c. Continuous-wave Doppler systems use light waves with frequencies from 10 to 20 kHz
- d. Ultrasound Doppler is unsuitable for assessment of microcirculatory flow
- e. Pulse-ultrasound Doppler requires knowledge of aortic wall thickness to measure flow

Did you know?

- Christian Doppler was one of the few physicists who has a Google Doodle dedicated to him on his 214th birthday.

Answers to questions for Chapter 16 – Blood flow measurement

Multiple true / false questions

The following answers are true:

1. a and d
2. a, b and d
3. c

Single best answer questions

The options below represent the single best answer, although other options may also be true:

1. a
2. e
3. d